CHAPTER 4
Fuel Systems

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SERVICE WARNINGS AND PRECAUTIONS

Service Warnings

When servicing the fuel system, it is important to heed the following warnings.

⚠ WARNING

PROPOSITION 65 WARNING
Snowmobile engines discharge fuel and exhaust which contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm, onto the snow on which they operate. Keep this engine properly tuned and avoid unnecessary idling and spillage during fueling.

Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored or used.

Do not overfill the tank past the bottom of the filler neck.

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately.

Never start the engine or let it run in an enclosed area.

Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

⚠ CAUTION

A main jet that is too small will cause a lean operating condition and may cause serious engine damage. Jet according to the jetting charts provided for each snowmobile.

Polaris snowmobile engines are calibrated to run using 91 octane (oxygenated) or 89 octane (non-oxygenated) fuels. Polaris snowmobiles requiring higher octane fuel have the required octane level noted on the fuel tank filler cap.

Never use fuel containing more than 10% ethanol or E85 fuels.

All fuel injectors must share the same color code (Yellow, Blue, or Red).

Always verify the fuel injector part number prior to installation.

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CARBURETOR FUEL SYSTEMS

Mikuni Main Jets

MAIN JET	PART NUMBER	MAIN JET	PART NUMBER	MAIN JET	PART NUMBER	MAIN JET	PART NUMBER
95	3130102	175	3130118	310	3130134	470	3130147
100	3130103	180	3130119	320	3130135	490	3130148
105	3130104	185	3130120	330	3130136	500	3130149
110	3130105	190	3130121	340	3130137	510 N	3131400
115	3130106	195	3130122	350	3130138	520 N	3131401
120	3130107	200	3130123	360	3130139	530 N	3131402
125	3130108	210	3130124	370	3130290	540 N	3131408
130	3130109	220	3130125	380	3130140	550 N	3131409
135	3130110	230	3130126	390	3130480	560 N	3131410
140	3130111	240	3130127	400	3130141		
145	3130112	250	3130637	410	3130599		
150	3130113	260	3130129	420	3130142		
155	3130114	270	3130130	430	3130143		
160	3130115	280	3130131	440	3130144		
165	3130116	290	3130132	450	3130145		
170	3130117	300	3130133	460	3130146		

Mikuni Pilot Jets

PILOT JET NUMBER	PART NUMBER
25	3130064
30	3130065
35	3130066
40	3130067
45	3130068
50	3130629
55	3130070
60	3130071

Mikuni Starter Jets

STARTER JET	PART NUMBER
130	3130805
135	3130767
140	3130768
145	3130769
150	3130770
155	3130771
160	3130772

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Mikuni Jet Needles

JET NEEDLE	PART NUMBER
J8-9FH04-57	3130794
J8-9EH01-57	3130795
J8-9DH01-54	3130796
J8-8BEY01	3131250
J8-9DFH06-57	3131253
J8-9EFH01-60	3131207
J8-9DFH07-60	3131268
J8-9DFH10-57	3131313
J8-9DGI01-60	3131377
J8-9DGJ02-57	3131378
J8-9EFY02-61	3131202
J8 - 9DGN6-57	3131438

Mikuni (Short) Pilot Air Jets

AIR JET	PART NUMBER
0.5	3130773
0.6	3130774
0.7	3130775
0.8	3130776
0.9	3130777
1.0	3130778
1.1	3130799
1.2	3130780
1.3	3130781
1.4	3130782
1.5	3130783
1.6	3130784
1.7	3130785
1.8	3130786
1.9	3130787
2.0	3130788

Mikuni (Long) Pilot Air Jets

AIR JET	PART NUMBER
0.5	3131255
0.6	3131249
0.7	3131256
0.8	3131254
0.9	3131203
1.0	3131257
1.1	3131258
1.2	3131259
1.3	3131260
1.4	3131261
1.5	3131262
1.6	3131263
1.7	3131264
1.8	3131265
1.9	3131266
2.0	3131267

Mikuni TM Piston Valves

PISTON VALVE	PART NUMBER
1.5	3130940
2.0	3131252
2.5	3130790
3.0	3130791
3.5	3130792
4.0	3130793

Mikuni TM (Notched) Piston Valves

PISTON VALVE	PART NUMBER
1.5	3131216
2.0	3131206
2.5	3131217
3.0	3131218
3.5	3131219
4.0	3131220

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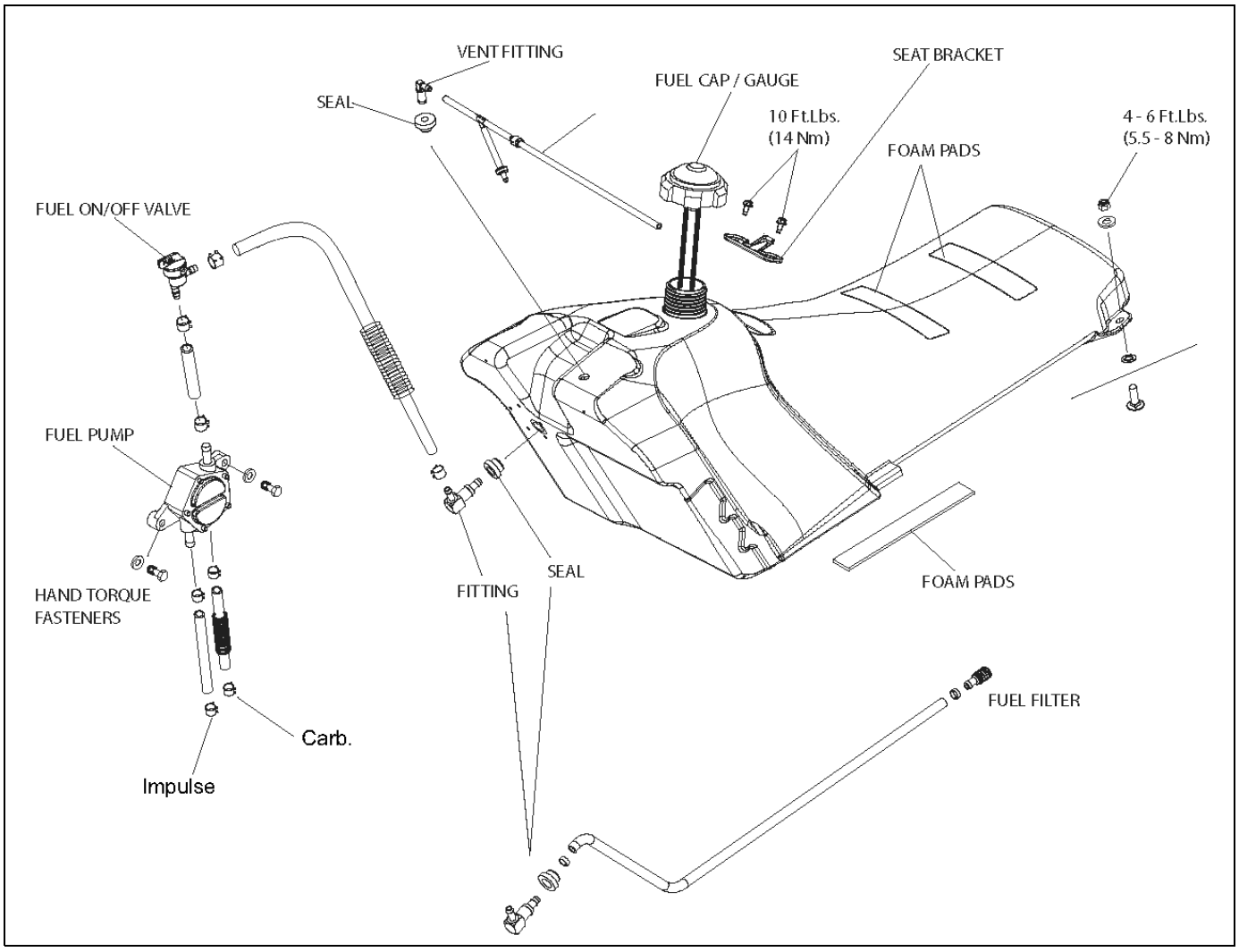
Carbureted Fuel System (Typical)



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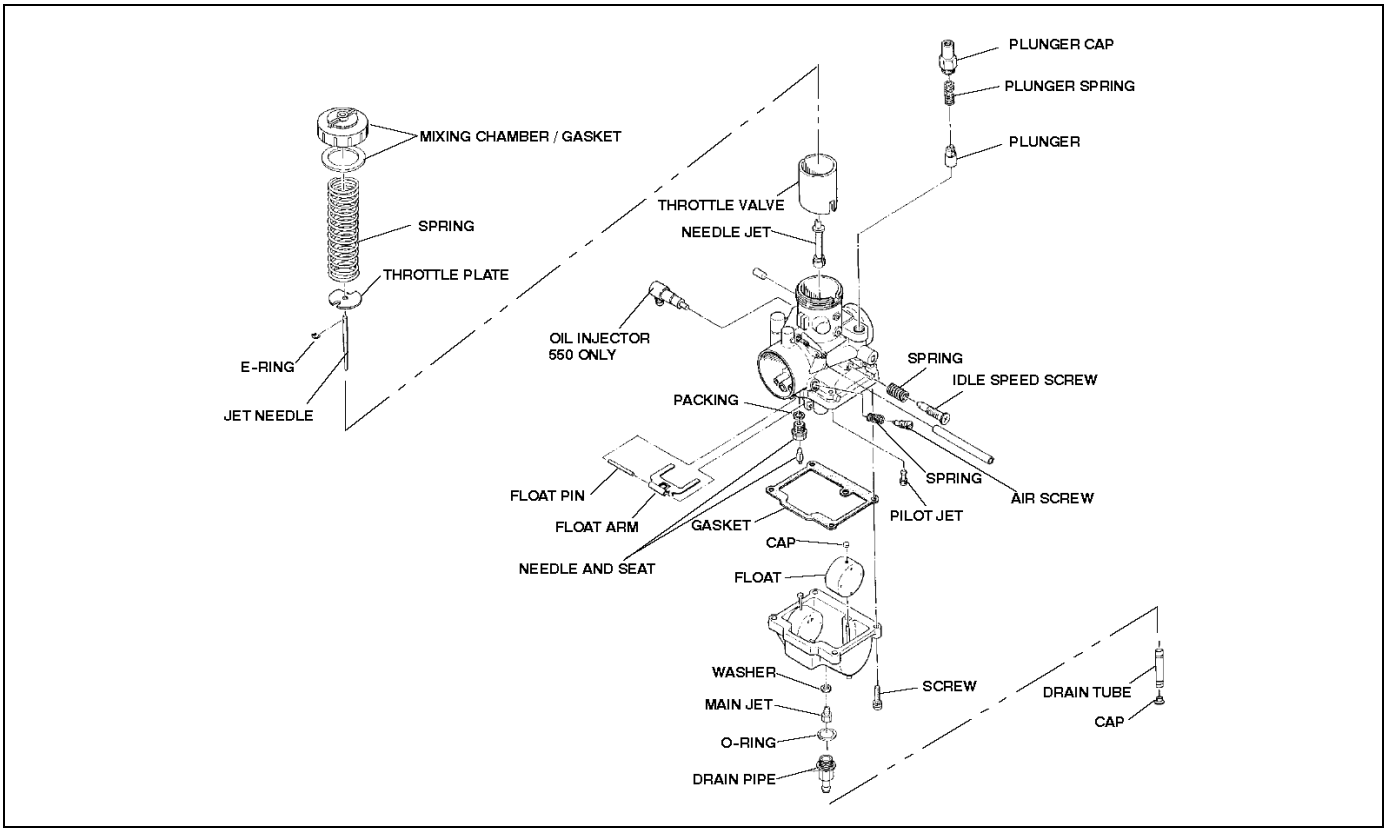
MIKUNI VM CARBURETOR

Assembly View



Mikuni VM Carburetor Function

The function of a carburetor is to produce a combustible air/fuel mixture by breaking fuel into tiny particles in the form of vapor, to mix the fuel with air in a proper ratio, and to deliver the mixture to the engine. A proper ratio means an ideal air/fuel mixture which can burn without leaving an excess of fuel or air. Whether the proper mixture ratio is maintained or not is the key to efficient engine operation.

The engine is operated under a wide range of conditions, from idling with the throttle valve almost closed, to full load or maximum output with the throttle valve fully opened. In order to meet the requirements for the proper mixture ratio under these varying conditions, a low speed fuel system, or pilot system, and a main fuel system are provided in Mikuni type carburetors.

A Mikuni VM carburetor uses several components and fuel metering circuits to deliver fuel at all throttle opening positions. These components and circuits include:

- Starting (Enrichment) Circuit
- Float System
- Idle Speed Adjustment
- Air Screw
- Idle / Slow Speed (Pilot) Circuit
- Throttle Valve / Cutaway
- Needle Jet/Jet Needle
- High Speed (Main Jet) Circuit

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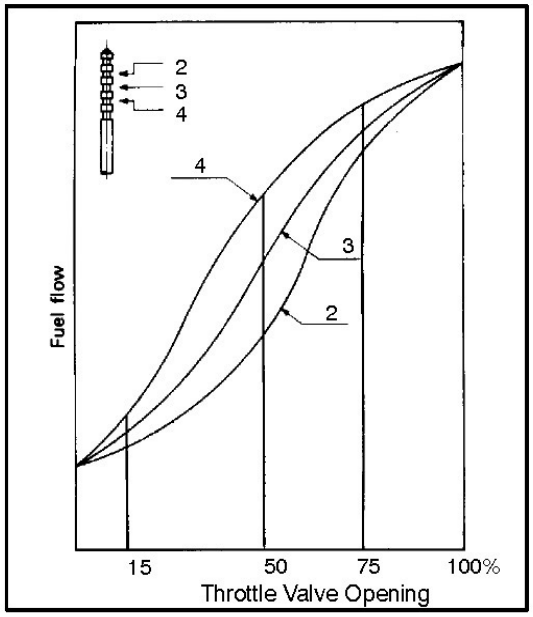
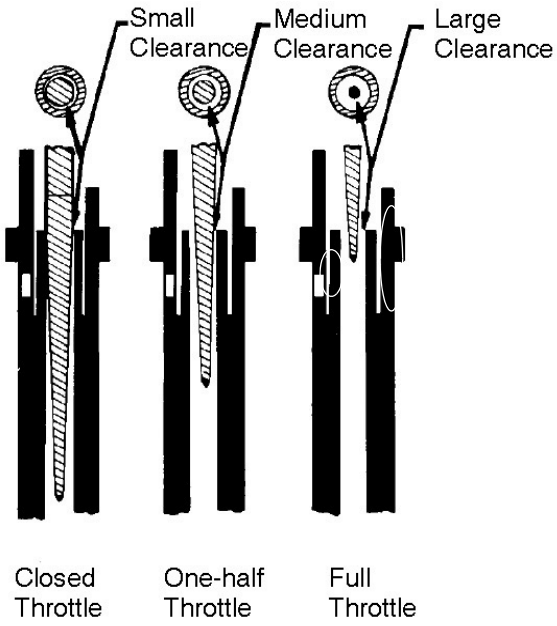
Throttle Opening and Fuel Flow

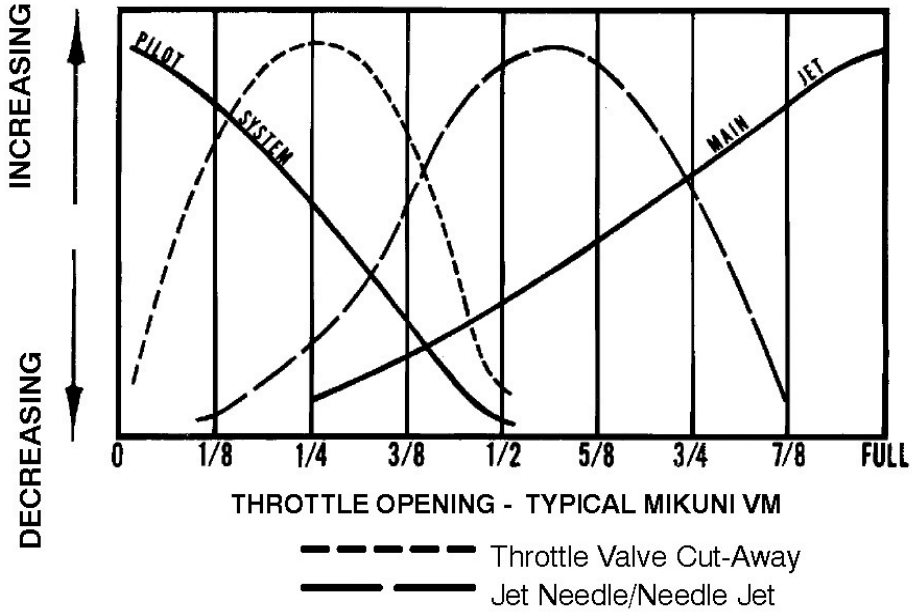
The illustration below depicts how each fuel metering circuit effects the total fuel flow of the carburetor as well as the fuel flow characteristics when the jet needle e-clip is moved from position 2 to position 4.

This illustration can be helpful when trying to diagnose a fuel-related problem when the throttle opening at which the rich or lean condition occurs is determined.

For example, changing main jets to resolve an off-idle hesitation or rich condition would do nothing as the main jet's effect on total fuel output is minimal at idle speeds.







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Starting / Enrichment System

The starting or enrichment system provides additional fuel required to start the engine in cold conditions. A cold engine requires more fuel to start than a warm engine because the fuel mixture tends to condense on the intake and cylinder walls rather than vaporize as it would in a engine at operating temperature.

Mikuni VM carburetors use a plunger-type starting system. When the choke lever is engaged, a spring-loaded plunger is pulled away from the starting circuit orifice allowing additional fuel to be drawn out of the float bowl along with the fuel drawn through the pilot jet system.

Because the starting system provides fuel not metered by the pilot or main jet systems, it is important to verify the plunger properly closes when not needed. A starting system that is stuck open or improperly set will cause rich running and heavy plug fouling.

Likewise, a plunger that is stuck closed or does not open far enough will make starting a cold engine difficult.

Float System

The float system is designed to maintain a constant height of gasoline during operation. When the fuel flowing from the fuel pump into the float chamber through the needle valve reaches the constant fuel level, the floats rise. When the buoyancy of the float and the fuel pressure of the fuel pump balance, the needle valve sticks fast to the needle seat, preventing further delivery of gasoline, thereby holding the standard level of gasoline.

The fuel level in the bowl assists in controlling the amount of fuel in the fuel mixture. Too high a level allows more fuel than necessary to leave the nozzle, enriching the mixture. Too low a level results in a leaner mixture, since not enough fuel leaves the nozzle. Therefore, the predetermined fuel level should not be changed arbitrarily.

Idle Speed Adjustment

The idle speed adjustment screw sets the height of the throttle slide inside of the mixing chamber. Turning the screw in (clockwise) raises the throttle slide and raises engine RPM. Turning the idle speed screw out (counter-clockwise) lowers the throttle slide and lowers engine RPM.

Always set the idle speed after the engine reaches operating temperature.

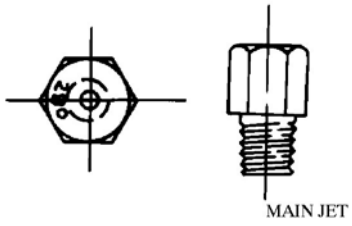
Air Screw

The air screw controls the amount of air that is mixed with the fuel drawn out of the float bowl. The more air allowed to mix with the fuel, the leaner the fuel mixture. Turning the screw in (clockwise) reduces the amount of air, while turning the screw out (counter-clockwise) increases the amount of air.

Pilot Jet

From idling to low speeds, the fuel supply is metered by the pilot jet. There are several air bleed openings in the sides of the pilot jet which reduce the fuel to mist. The number stamped on the jet is an indication of the amount of fuel in cc's which passes through the jet during a one minute interval under a given set of conditions.

Main Jet


MAIN JET

When the throttle opening becomes greater and the area between the needle jet and jet needle increases, fuel flow is metered by the main jet. The number on the jet indicates the amount of fuel which will pass through it in one minute under controlled conditions. Larger numbers give a greater flow, resulting in a richer mixture. Main jets are screwed directly into the needle jet base.

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Jetting Guidelines

Changes in altitude and temperature affect air density, which is essentially the amount of oxygen available for combustion. In low elevations and cold temperatures, the air has more oxygen. At higher elevations and in higher temperatures, the air is less dense.

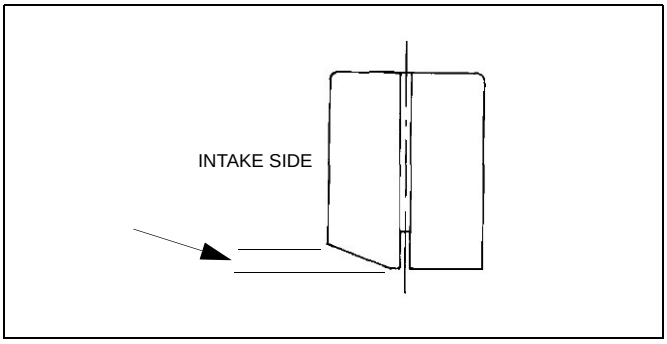
Verify the production setting for your specific model. All carburetors must be re-calibrated if operated outside the production temperature and/or altitude range. The main jet installed in production is not correct for all altitudes and/or temperatures. Refer to the jetting cart in the Specifications Chapter of this manual for correct jetting for altitude/temperature ranges.

NOTE: It is the owner's responsibility to ensure that the correct jets are installed in the machine for a geographical area. Be very careful when jetting down in warm weather. As the weather turns colder it will be necessary to re-jet to prevent engine damage. When selecting the proper main jet always use the lowest elevation and temperature that is likely to be encountered.

⚠ CAUTION

A main jet that is too small will cause a lean operation condition and may cause serious engine damage. Jet the carburetors carefully for elevation and temperature according to the jetting charts in the Specifications Chapter of this manual or the models' Owner's Manual Supplements.

Piston / Throttle Valve



The throttle valve controls the rate of engine air intake by moving up and down inside the main bore. At small throttle openings, air flow control is performed chiefly by the cutaway. By controlling air flow the negative pressure over the needle valve is regulated, in turn varying the fuel flow.

The throttle valves are numbered 1.0, 1.5, 2.0, etc., according to the size of the cutaway in millimeters. The higher the number, the leaner the gasoline/air mixture.

Jet Needle/Needle Jet

The jet needle and needle jet have the most effect between 3/8 and 3/4 throttle opening. Some mixture adjustment can be accomplished by changing the location of the "E" clip on the needle. Moving the clip down raises the needle in the jet passage and enriches the mixture. Moving the clip up lowers the needle in the jet passage and leans the mixture. Letter and number codes are stamped into the needle and the jet indicating sizes and tapers (taper of needles only) of each.

Jet Needle

The jet needle tapers off at one end and the clearance between the jet needle and the needle jet increases as the throttle valve opening gets wider. The air/fuel mixture ratio is controlled by the height of the "E" ring inserted into one of the five slots provided in the head of the jet needle.

Needle Jet

The needle jet works in conjunction with the jet needle.

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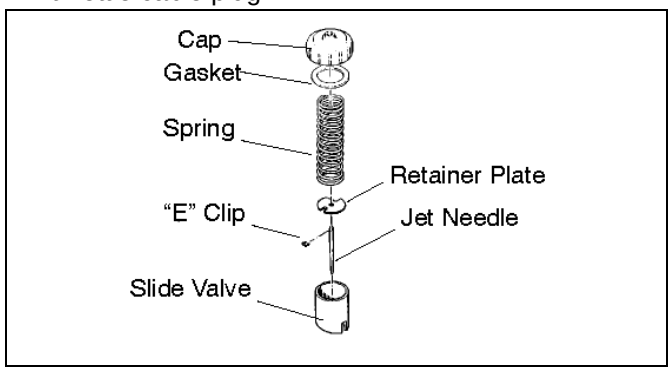
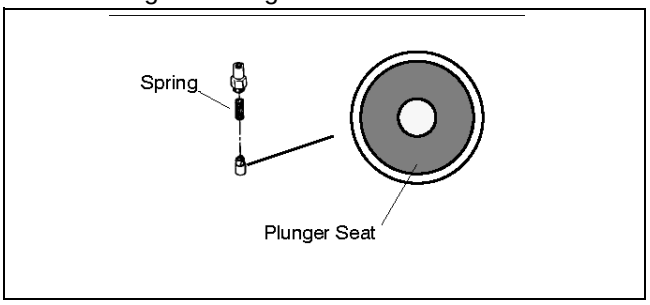
VM CARBURETOR DISASSEMBLY / INSPECTION / ASSEMBLY

VM Carburetor Disassembly

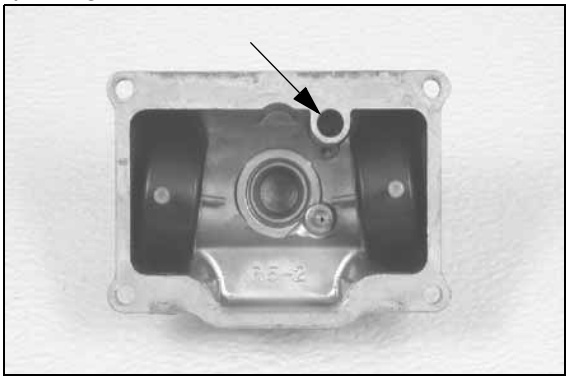
1. Remove the throttle slide cap, spring, and throttle slide. Extract the retainer to remove the needle and throttle cable plug.



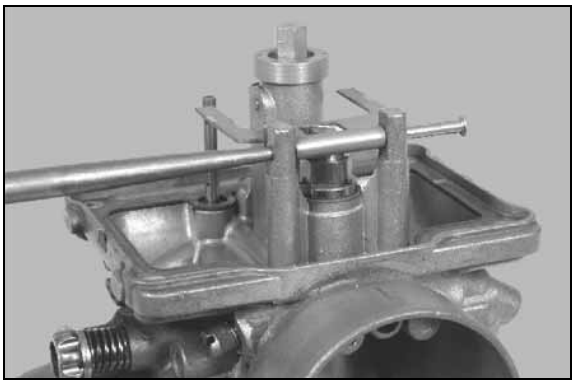
2. Remove the choke plunger. Inspect the plunger for wear and replace if required. Inspect the plunger seat for damage or foreign material.



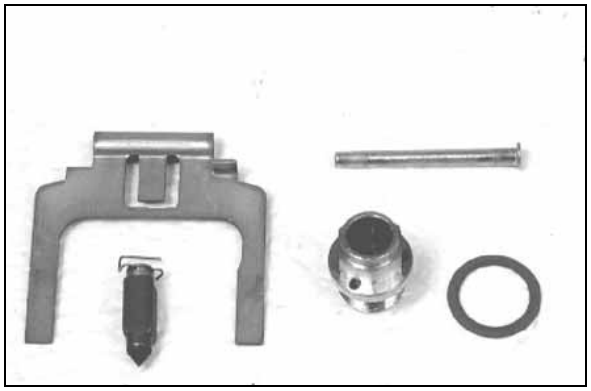
3. Check the choke plunger and cable movement. Plunger must move up and down in bore without binding.
4. Remove the float bowl. Inspect the choke fuel supply passage.



5. Remove the float pin, then remove the inlet needle and seat assembly.



6. Inspect the needle tip for abnormal wear and tear. Replace if required.



7. Remove the pilot and main jets.
8. Thoroughly clean the carburetor body with carburetor cleaner. Blow dry with compressed air. Verify all air, fuel, and choke passages are clean.

> **⚠ CAUTION**
>
> Always wear eye protection when using compressed air.

9. Assembly is the reverse of disassembly.

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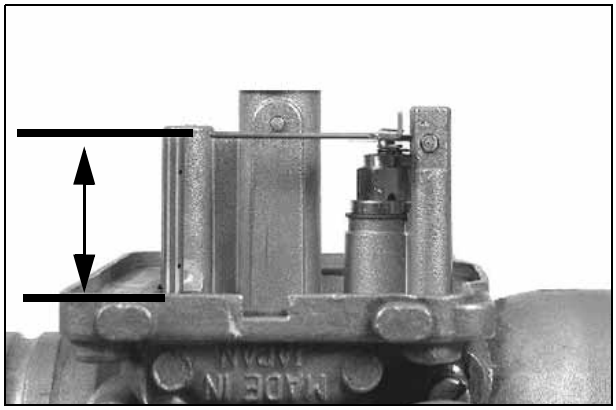
Float Arm Adjustment

Proper float arm adjustment in critical to carburetor performance.

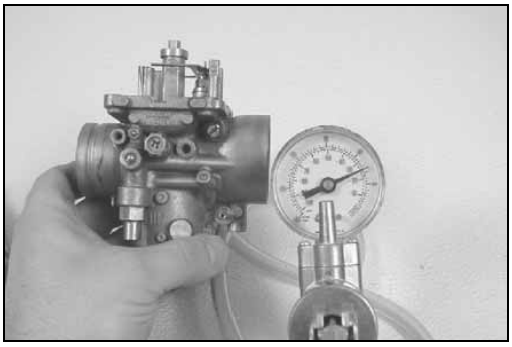
1. Invert carburetor assembly.
2. Carefully bend the float arm tang contacting the inlet needle so the float arm legs are parallel with the float bowl mating surface.



Needle and Seat Leak Testing

A leaking needle and seat can cause hard starting and poor runability issues.

1. Invert the carburetor assembly. Verify the float arm is properly adjusted.
2. Attach a Mity Vac pressure pump to the fuel inlet fitting.



3. Apply approximately 5 PSI of pressure and wait for at least one minute. The needle and seat should hold the pressure indefinitely. If the pressure drops rapidly, replace the needle and seat assembly.

MIKUNI TM CARBURETOR

Function

The function of a carburetor is to produce a combustible air/fuel mixture by breaking fuel into tiny particles in the form of vapor, to mix the fuel with air in a proper ratio, and to deliver the mixture to the engine. A proper ratio means an ideal air/fuel mixture which can burn without leaving an excess of fuel or air. Whether the proper mixture ratio is maintained or not is the key to efficient engine operation.

The engine of a vehicle is operated under a wide range of conditions, from idling with the throttle valve remaining almost closed, to full load or maximum output with the throttle valve fully opened. In order to meet the requirements for the proper mixture ratio under these varying conditions, a low speed fuel system, or pilot system, and a main fuel system are provided in Mikuni type carburetors. The Mikuni carburetor has varying operations depending upon varying driving conditions. It is constructed of a float system, pilot system, main system, and starter system or initial starting device.

Float System

The float system is designed to maintain a constant height of gasoline during operation. When the fuel flowing from the fuel pump into the float chamber through the needle valve reaches the constant fuel level, the floats rise. When the buoyancy of the float and the fuel pressure of the fuel pump balance, the needle valve sticks fast to the needle seat, preventing further delivery of gasoline, thereby holding the standard level of gasoline.

The fuel level in the bowl assists in controlling the amount of fuel in the fuel mixture. Too high a level allows more fuel than necessary to leave the nozzle, enriching the mixture. Too low a level results in a leaner mixture, since not enough fuel leaves the nozzle. Therefore, the predetermined fuel level should not be changed arbitrarily.

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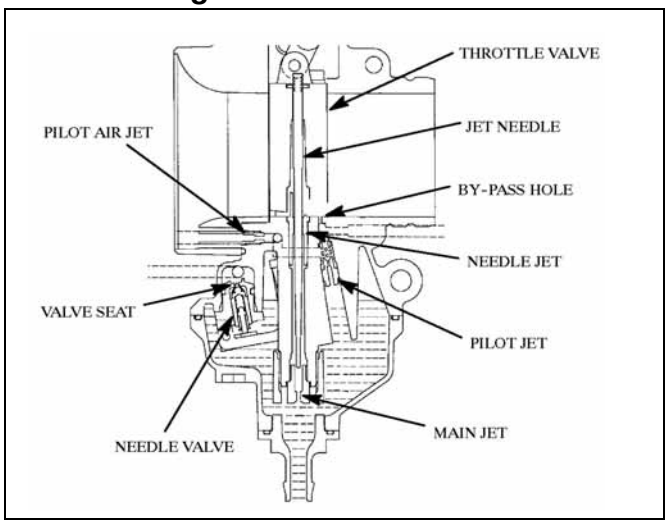
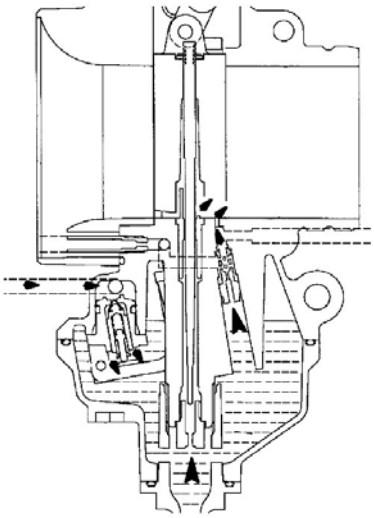
Fuel Metering



Mikuni carburetors use a starter enricher system rather than a choke. In this type of carburetor, fuel and air for starting the engine are metered with entirely independent jets. The fuel metered in the starter jet is mixed with air and is broken into tiny particles in the emulsion tube. The mixture then flows into the plunger area, mixes again with air coming from the air intake port for starting and is delivered to the engine through the fuel discharge nozzle in the optimum air/fuel ratio. The starter is opened and closed by means of the starter plunger. The starter type carburetor is constructed to utilize the negative pressure of the inlet pipe, so it is important that the throttle valve is closed when starting the engine

Fuel Delivery

The pilot system's main function is to meter fuel at idle and low speed driving. Though its main function is to supply fuel at low speed, it does feed fuel continuously throughout the entire operating range.



FUEL DELIVERY

Fuel for the pilot jet is drawn from the float bowl, mixed with air jet, and delivered to the engine through the pilot outlet.

The mixture is regulated to some degree by adjusting the fuel screw.

The main system is designed to deliver fuel between low speed and high speed operation. This system is made up of the jet needle, needle jet, and main jet. The main system begins to take effect as soon as there is enough air flow into the carburetor venturi to draw fuel up through the main jet and needle jet assembly. This system works in conjunction with the needle jet system.

During low speed driving, there is very little clearance between the jet needle and the needle jet; therefore, very little fuel from the main jet can pass between the jet needle and the needle jet. As the throttle valve opening is increased, the tapered jet needle is raised farther out of the needle jet, allowing greater fuel flow. Under full throttle opening, the cross sectioned area of clearance between the jet needle and the needle jet becomes greater than the cross sectioned area of the main jet. Thus the main jet is now controlling the amount of fuel flow.

Pilot Jet

From idling to low speeds, the fuel supply is metered by the pilot jet. There are several air bleed openings in the sides of the pilot jet which reduce the fuel to mist. The number stamped on the jet is an indication of the amount of fuel in cc's which passes through the jet during a one minute interval under a given set of conditions.

Fuel Screw

The fuel screw controls the fuel mixture from idle to low speeds. The tapered tip of the fuel screw projects into the passage leading to the by pass out let. By turning the screw in or out, the cross sectional area of the air passage is varied, in turn varying the fuel screw varies the amount of air/fuel.

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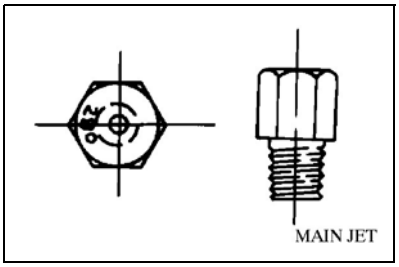
Main Jet



When the throttle opening becomes greater and the area between the needle jet and jet needle increases, fuel flow is metered by the main jet. The number on the jet indicates the amount of fuel which will pass through it in one minute under controlled conditions. Larger numbers give a greater flow, resulting in a richer mixture. Main jets are screwed directly into the needle jet base.

Jetting Guidelines

Changes in altitude and temperature affect air density, which is essentially the amount of oxygen available for combustion. In low elevations and cold temperatures, the air has more oxygen. In higher elevations and higher temperatures, the air is less dense.

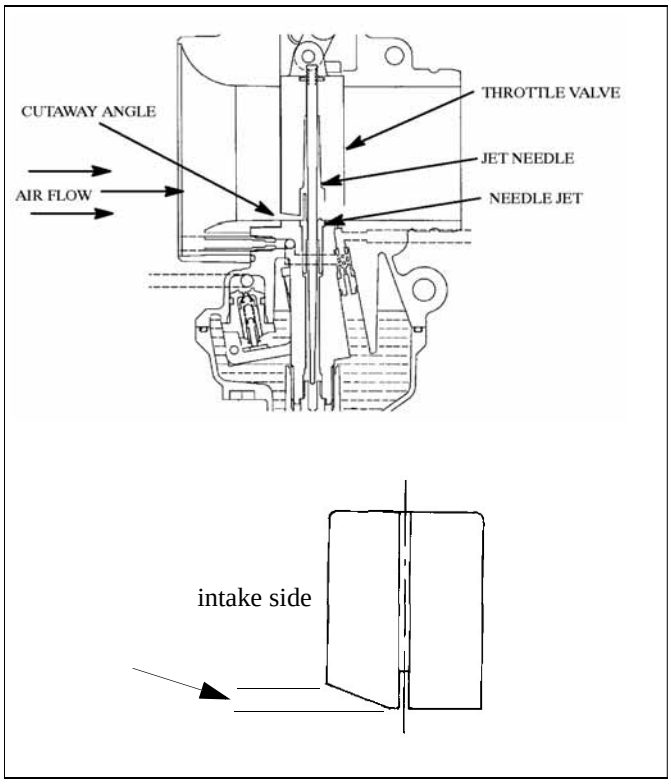
Verify the production setting for your specific model. All carburetors must be re-calibrated if operated outside the production temperature and/or altitude range. The main jet installed in production is not correct for all altitudes and/or temperatures. Refer to the jetting cart in the Specifications Chapter of this manual for correct jetting for altitude/temperature ranges.

NOTE: It is the owner's responsibility to ensure that the correct jets are installed in the machine for a geographical area. Be very careful when jetting down in warm weather. As the weather turns colder it will be necessary to re-jet upward to prevent engine damage. When selecting the proper main jet always use the lowest elevation and temperature that is likely to be encountered.

⚠ CAUTION

A Main Jet that is too small will cause a lean operation condition and may cause serious engine damage. Jet the carburetors carefully for elevation and temperature according to the jetting charts in the, Specifications Chapter of this manual or the models Owner's Manual Supplements.

Piston/Throttle Valve



The throttle valve controls the rate of engine air intake by moving up and down inside the main bore. At small throttle openings, air flow control is performed chiefly by the cutaway. By controlling air flow the negative pressure over the needle valve is regulated, in turn varying the fuel flow.

The throttle valves are numbered 1.0, 1.5, 2.0, etc., according to the size of the cutaway in millimeters. The higher the number, the leaner the gasoline/air mixture.

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Jet Needle

The jet needle tapers off at one end and the clearance between the jet needle and the needle jet increases as the throttle valve opening gets wider. The air/fuel mixture ratio is controlled by the height of the “E” ring inserted into one of the five slots provided in the head of the jet needle.

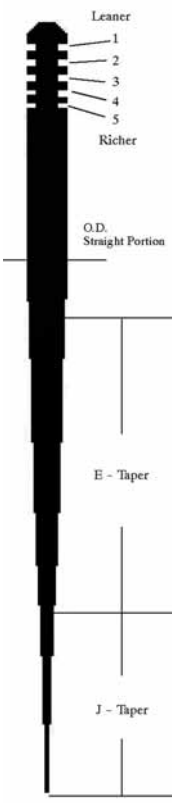
This needle (example) is a 9DH01-57. The first number is the approximate overall length in 10mm increments of the jet needle. The 9 indicates the needle is approximately 90mm but less that 100mm in length.

The letters on the jet needle indicate the angle of both tapers. The first letter designates the taper angle of the top section (closest to the grooves) and the second letter designates the angle of the bottom taper. The taper angles are graduated in 15' (15 minute) increments. The jet needle marked 9DH01-57 would have a top taper of 1_0' and a bottom taper of 2_0'.

The number following the letters on the jet needle is the serial number and it varies with individual jet needles.

The last number, 57 indicates that the outside diameter is 2.57mm. The smaller the O.D., the richer the mixture.

9DH01-57



DESIGNATOR	DESCRIPTION
9	Overall length in 10mm increments
D	Taper of the **top** section of the needle
H	taper of the **bottom** section of the needle
01	Serial number
-57	Outside diameter (O.D.) of the straight portion

Needle Jet

The needle jet works in conjunction with the jet needle.

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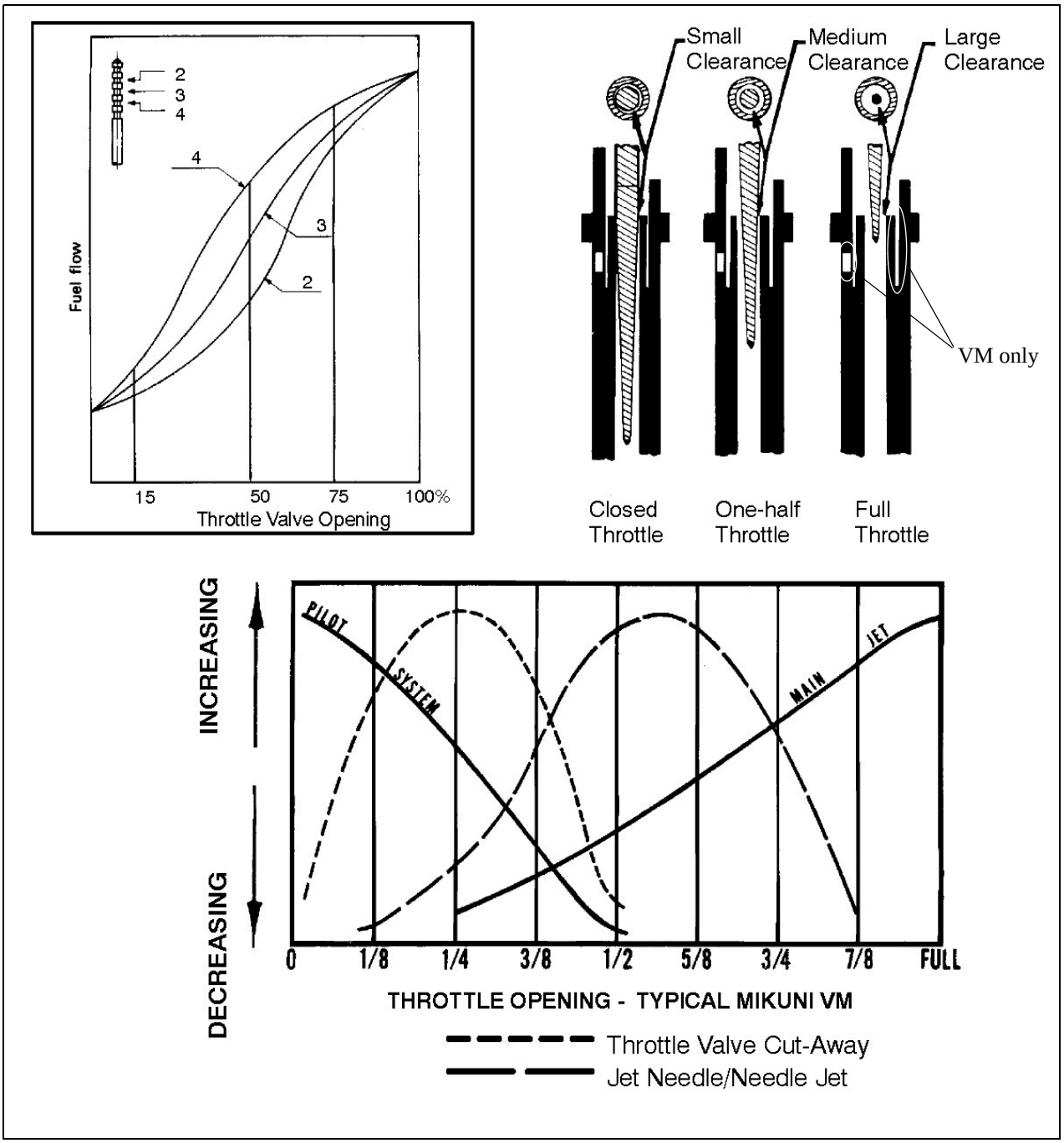
Throttle Opening Vs. Fuel Flow



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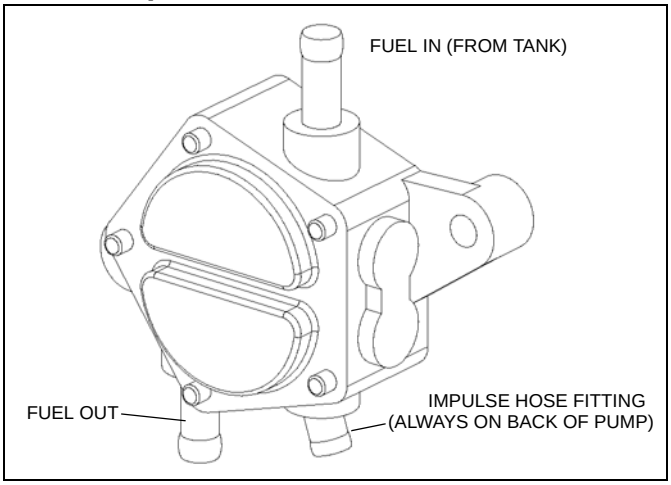
CARBURETOR FUEL PUMP

Fuel Pump Overview



The impulse-powered fuel pump on carbureted engines works by using the positive and negative pressure pulses generated by the movement of the pistons inside the engine crankcase.

When the MAG piston is on the upward stroke, negative (vacuum) pressure pulse is applied to the fuel pump. This action draws fuel into the pump from the fuel tank.

When the MAG piston is on the downward stroke, a positive pressure pulse is applied to the fuel pump. This action forces fuel from the intake-side of the pump to the supply-side, then to the carburetors.

A series of check valves prevents fuel from being drawn out of the carburetors on the vacuum stroke or forced back into the fuel tank during the pressure stroke.

Maintenance

The impulse operated-powered fuel pump does not require any specific scheduled maintenance. However, the following procedures should be observed:

- Operation

The pump may be checked for operation by removing the fuel supply line from the carburetor and placing it into a container. With the engine idling at approximately 2000 RPM, a steady flow of fuel should be visible.

- Cleaning

The impulse line must be disassembled and cleaned of foreign material in the event of piston or other internal engine part failures which produce fragments.

- Inspection

Disconnect impulse line from pump. Connect a Mity Vac to impulse fitting (or line) and apply 4-6 PSI pressure. Diaphragm should hold pressure indefinitely.

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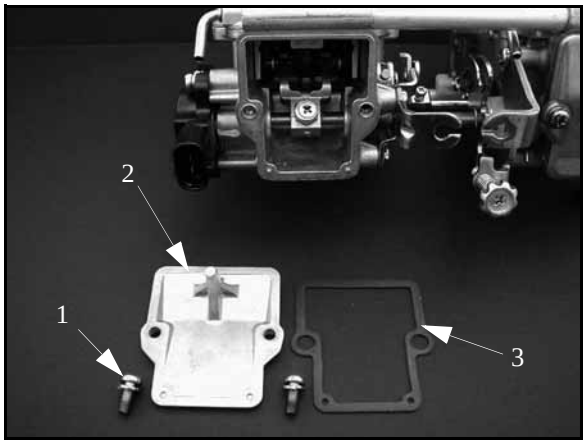
CARBURETOR SERVICE

Disassembly

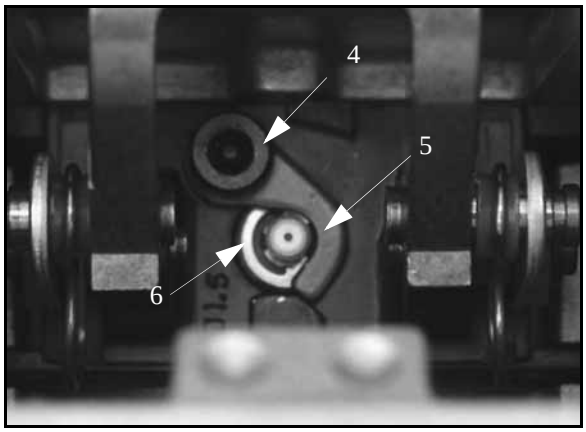
CAUTION

WEAR EYE PROTECTION WHEN USING COMPRESSED AIR OR WHEN USING CLEANING SOLVENTS. REVIEW ALL FUEL SYSTEM WARNINGS LOCATED AT THE BEGINNING OF THIS CHAPTER BEFORE PROCEEDING.

1. Remove the carburetor from the engine before disassembling. Clean the outside of the carburetor thoroughly with solvent. Do not use compressed air to dry at this time.
2. Remove all top cap screws (1), top cap (2) and gasket (3).

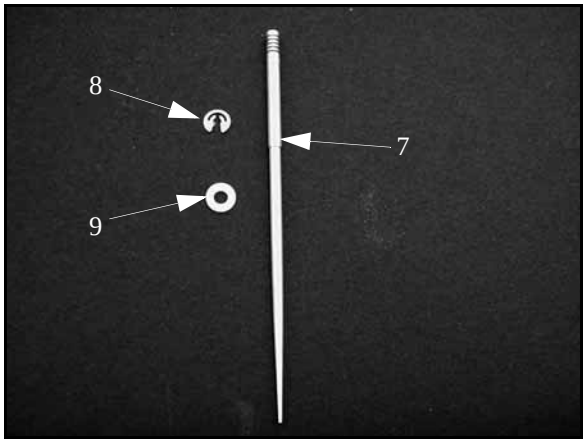


3. Locate the arm screw (4) and loosen it just enough to move the arm (5) out of the way so that you can remove the needle (6) e-clip and the plastic washer from the throttle slide.

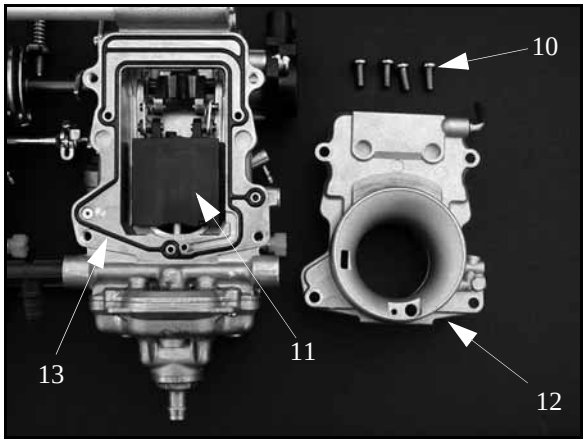


NOTE: Keep track of the plastic washer (9), and place it so it is on the top of the throttle valve when installing the needle and e-ring back into the carburetor.

4. Inspect the needle (7), e-clip (8), and plastic washer (9) for wear.



5. Remove the four screws (10) on the funnel face.
6. Turn throttle shaft so the throttle slide (11) slides open all the way.
7. With slide fully open, pull funnel (12) out from the bottom first. Inspect the gasket (13).
8. Check for wear on the faces of the slides.



9. Inspect e-rings, plate, spring, and rings (14)

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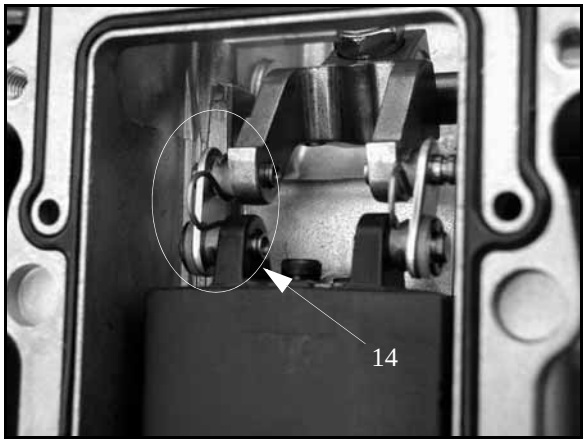
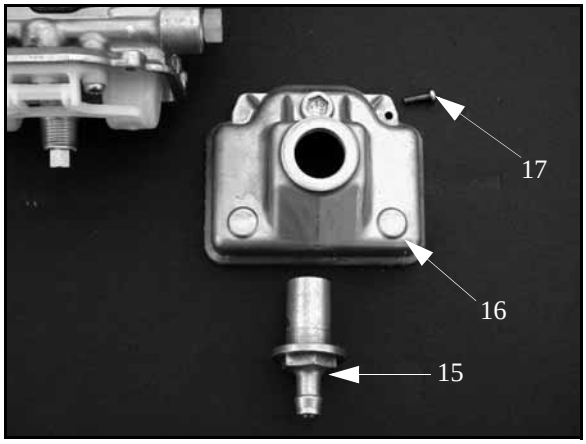
connecting the slide to the lever if needed.

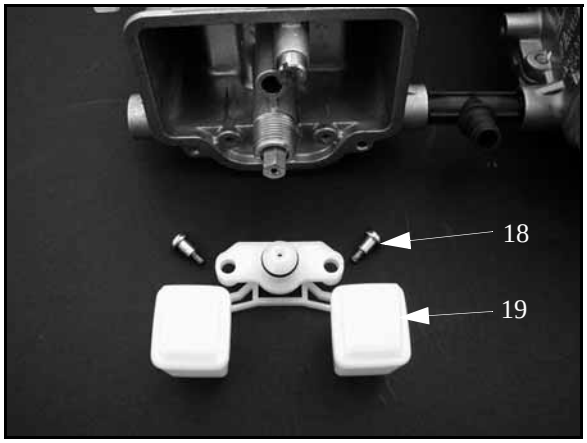


10. Remove water trap/drain plug (15) and single screw (16) on the bottom of the carburetor.
11. Remove and drain the float bowl (17).

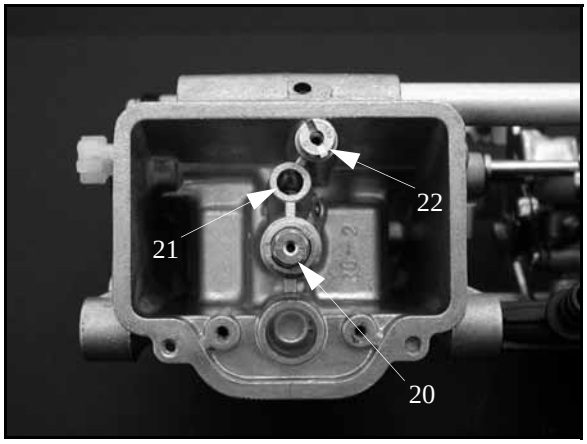
NOTE: Float bowl will not come off unless the water trap/drain plug and screw are removed.



12. Remove the two screws (18) holding the float/needle and seat assembly (19) in position and remove this assembly.
13. Inspect the contents for wear and debris.



14. Remove and inspect the main jet (20), pilot jet (21), and starter jet (22). Clean them out.
15. Remove the air jet screw if so equipped.



16. Clean out all passages in carburetor body with carburetor cleaner. Dry all passages and jets with compressed air.
17. Replace gaskets and any parts that show wear or damage.
18. Repeat steps 1-18 for disassembly for the other carburetor if needed.

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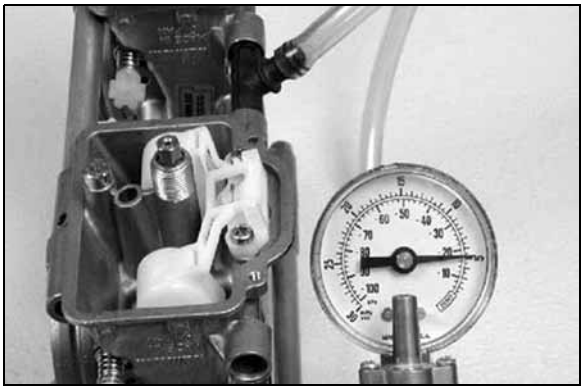
Assembly

1. Install the main jet (20), pilot jet (21), and starter jet (22).
2. Install float/needle & seat assembly (19).
3. Place carburetor in an inverted position.
4. Connect a pressure tester (PN 2870975) to fuel inlet fitting. Apply 5 psi pressure and observe for one minute. The needle and seat should hold pressure indefinitely. If the pressure drops, carefully inspect the needle and the needle seat. The needle can be replaced (needle supplied with float and seat).



5. Carefully inspect float bowl gasket and replace if necessary.
6. Install float bowl (16) on carburetor with water trap/ drain plug (15) and single screw (16) on the bottom of the carburetor.
7. If throttle slide was removed, install throttle slide (11) so that the wider face is facing the engine side of the carburetor.
8. Install the funnel gasket (13) and funnel (12) onto the carburetor. You will have to lift the throttle slide up and place the smaller face into the funnel area.
9. Install funnel screws (10).
10. Install the e-clip (8) in the desired position on the jet needle (7).
11. Slide the plastic washer (9) on the jet needle so that it is positioned to rest on top of the throttle valve when assembled.
12. Install carburetors on engine.
13. Replace top cap gaskets (3), cover (2) and screws (1).
14. Check throttle lever free play.

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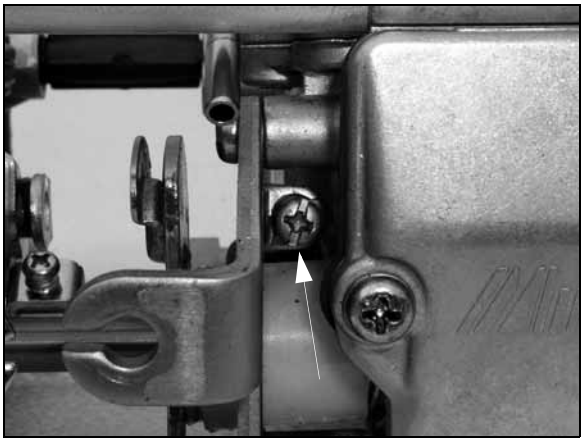
CARBURETOR ADJUSTMENT

Throttle Valve Synchronization

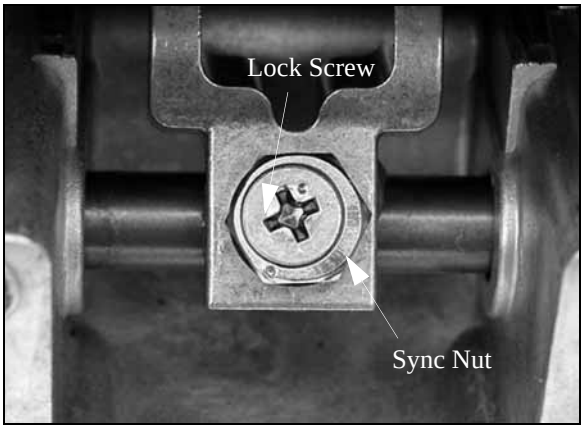
All throttle valve synchronization adjustments are made to the MAG throttle valve. The PTO throttle valve is non-adjustable and considered the base throttle valve.

Throttle valve synchronization can be performed with the carburetor rack installed or removed from the engine.

1. If running, turn off engine. Remove the air box.
2. Remove the carburetor covers.
3. Hold the throttle bell crank wide open on the carburetor.
4. The bottoms of each throttle valve should be flush with the top of the intake bores.
5. If adjustment is required, hold the PTO carburetor flush with the top of intake bore. Turn the throttle stop screw in or out to set the PTO throttle slide flush with the intake bore.



6. Once the PTO carburetor slide is flush, loosen the Phillips head screw, located under the top cover on the MAG carburetor.
7. While holding the PTO carburetor slide flush to the top of the carburetor, rotate the synchronization nut clockwise to raise the slide and counterclockwise to lower the slide.



8. Adjust the synchronization nut until it is even with the PTO slide.
9. Once this is flush, lock the locking screw.
10. Replace the carburetor covers.
11. If removed, reinstall the fuel, vent, throttle, and choke hose and cable connections.
12. Verify and set throttle cable free play.

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CLEANFIRE™ FUEL INJECTION

System Overview

There are two CFI engine management systems used on 2007 - 2011 Polaris snowmobiles:

- CFI 4
- DC-CFI

The primary difference between the CFI and DC-CFI systems is how each system handles stator voltage. In a CFI system, 100% of the stator AC voltage is converted to DC voltage. In contrast, DC-CFI systems only covert the engine management and select accessory circuits to DC voltage. The head lamps, brake lamps, and hand/thumb warmers are supplied with AC voltage.

Broken down by component, the detailed differences are included in the text below:

- **ECU: (ALL)** - The ECU controls the ignition / fuel injection angles, chassis / battery relays, and supplies the MFD gauge with tachometer / water temp. / PERC / HOT / DET / diagnostic information.

⚠ CAUTION

CFI 4/DC-CFI 2/DC-CFI 2+2 ECUs cannot be interchanged. Serious engine damage may occur.

- **Stator**: **CFI 4** - The stator consists of a lighting charge coil, ignition exciter coil, fuel injector charge coil and two independent external crank position (two and five pulse) coils.

  DC-CFI - Stator lighting charge coil split into two independent circuits; one for DC power (Chassis) and one for AC power (Lighting).

- **Flywheel**: **CFI 4** - The CFI flywheel contains the magnets for energizing the stator windings as well as two independent encoder ribs. The set of two encoder ribs are spaced 180 degrees apart from each other and provide RPM information required at engine start up. A set of five encoder ribs is responsible for crank angle detection, speed, and direction information.

  DC-CFI - Same as the CFI 4 with the exception that the flywheel is forged and the fan cover is removed from flywheel.

- **Regulator/Rectifier**: **CFI 4** - Converts VAC to VDC for the chassis and battery (electric start) circuits. Regulates voltage to 14.5 VDC. Also supplies fuel pump “boost” power when engine RPM is 700 RPM or less.

  DC-CFI - Supplies power to the ECU, fuel pump “boost power”, MFD, and accessory DC power points. DC-CFI models utilize a separate regulator for the AC circuit similar to carbureted models to regulate AC voltage to 14.3 VAC and battery charge voltage to 14.7 VDC.

- **Capacitor**: **(ALL)** - The capacitor suppresses voltage spikes and ensures consistent voltage throughout the CFI chassis (RED/WHT) circuit, or DC-CFI (RED-RED/WHT) circuits.

- **Chassis Relay**: **CFI 4 -** The chassis relay is activated by the ECU at approximately 950 RPM. Below 950 RPM, all power supplied by the regulator / rectifier (RED circuit) is used to power the ECU and fuel pump.

  DC-CFI - The chassis relay supplies power to the MFD gauge, accessory plug and DC power test plug.

- **Ignition Coils**: **(ALL)** - Provide ignition energy to each spark plug. Both coils are fired at the same time.

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- **Fuel Injectors**:
  DC-CFI 2 (600) - A fuel injector is mounted to each cylinder.

  DC-CFI 2+2/CFI 4 - A set of injectors are mounted to the crankcase, and a set are mounted to the cylinders.

- **Knock Sensor**: **(ALL)** - Located on the cylinder head, the detonation sensor transforms internal acoustic information into a signal the ECU uses to determine the amount of combustion knock. To function properly, the knock sensor mounting bolt must be installed dry and torqued to specification.

- **Exhaust Valve Solenoid**: **(ALL)** - Activated by the ECU, the solenoid controls the VES venting. When powered, the solenoid is open, allowing cylinder pressure to vent, keeping the exhaust valves closed. When power is removed, the solenoid closes and the exhaust valves are allowed to open.

- **Throttle Position Sensor (TPS)**: **(ALL)** - The TPS relays the position of the throttle plates (operator throttle input) to the ECU.

- **Coolant Temperature Sensor**: **(ALL)** - Relays the engine temperature to the ECU.

- **Exhaust Temperature Sensor**: **(ALL)** - Relays the temperature of the exhaust pipe to the ECU.

- **Temperature / Barometric Air Pressure (TMAP) Sensor**: **(ALL)** - Relays the current intake air temperature and ambient air pressure to the ECU. The sensor is located on the airbox. To function properly, the sensor must be free from foreign material, oil, and grease.

- **Vehicle Speed Input**: **(ALL)** - The ECU monitors the vehicle speed supplied by the vehicle speed sensor.

- **Fuel Pump**: **(ALL)** - Supplies fuel to the fuel injectors. Power to the fuel pump is supplied by the regulator / rectifier.

- **Diagnostic Connector**: **(ALL)** - The ECU can communicate with the Polaris Digital Wrench software and can be re-flashed, monitored and display trouble codes.

Detonation Control System (DET)

All CFI Models: When DET is sensing and taking action to reduce detonation, the driver may notice a drop in engine RPM and/or reduced performance as the ECU takes action to reduce detonation.

600 IQ Widetrak/800 CFI* Only: The check engine MIL will illuminate when the DET system is active.

600 IQ Widetrak/800 CFI* Only: If the ECU determines the detonation cannot be controlled by normal means and further operation may cause engine damage, the check engine MIL will flash and the ECU will limit the maximum engine speed to 6,000 RPM. The RPM limit will remain active until the driver turns off and restarts the engine.

800 CFI* Only: If the RPM limit mode occurs, a Diagnostic Trouble Code (DTC) will be registered. Digital Wrench will display the P1336 DTC.

600 IQ Widetrak Only: If the RPM limit mode occurs, a Diagnostic Trouble Code (DTC) will be registered. Digital Wrench will display the following codes: P1336, P2336, P1337, and P2337.

**** = Retroactive to 2008 - 2009 800 CFI models after Service Bulletins S-09-08 or S-09-09 are performed.***

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CFI Fuel Select Modes

⚠ CAUTION

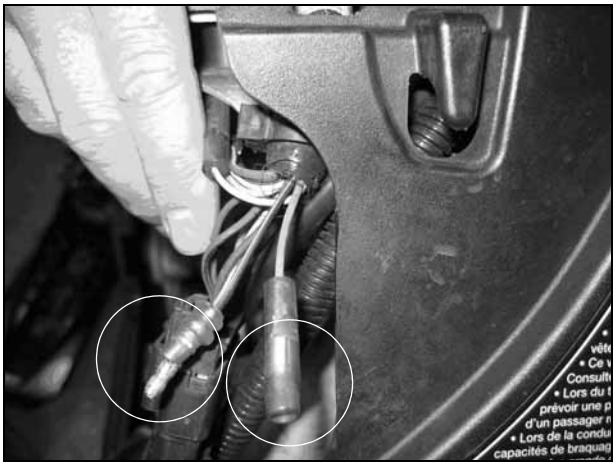
Always unplug the fuel selector jumper wires if unsure of fuel type. Severe engine damage may occur if jumper wires are plugged together when using ethanol-blended fuel.

Never use fuels containing more than a 10% ethanol blend.

Some 2009-2011 CFI models allow the operator to select between 91 octane ethanol and 91 octane oxygenated fuel modes. Models with this feature are noted in the Model Specifications chapter.

The fuel selector switch consists of a PINK and a BLACK/BLUE wire located at the rear of the clutch cover / electrical center cover.

When using oxygenated fuel or when unsure of the fuel type inside the fuel tank, unplug the two wires.



When using non-oxygenated, 91 or higher octane fuel, plug the two wires together.

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DC-CFI Fuel Select Modes

⚠ CAUTION

Always verify the ETHANOL resistor plug is installed in the selector plug if unsure of fuel type. Severe engine damage may occur if the PREMIUM resistor plug is installed when oxygenated fuel.

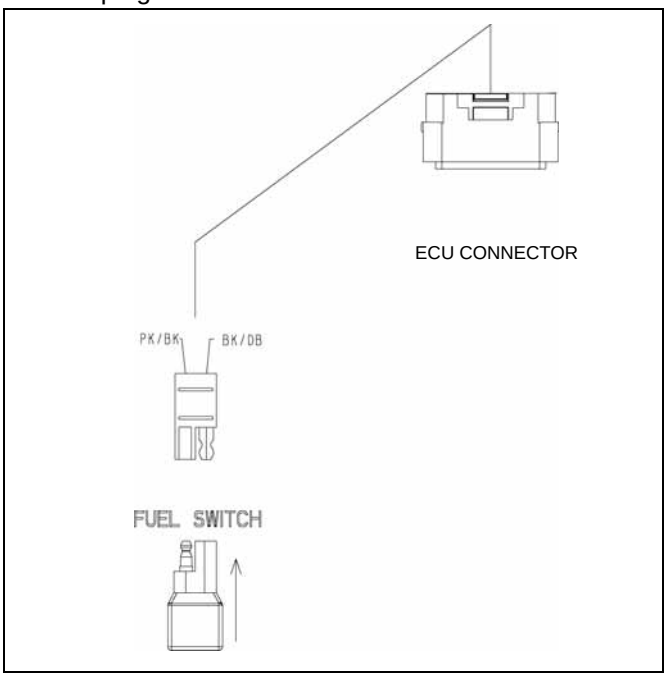
Never use oxygenated fuels containing more than a 10% ethanol blend.

DC-CFI models allow the operator to select between 91 octane oxygenated and 91 octane non-oxygenated fuel modes.

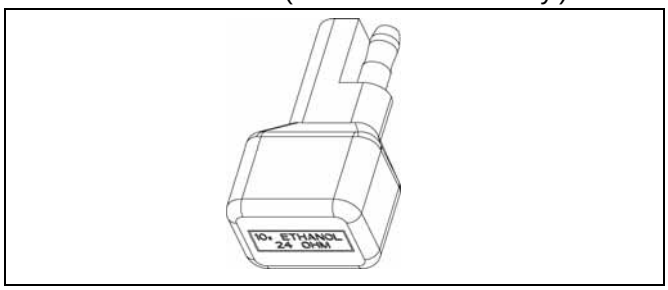
The fuel selector switch consists of a PK/BLK-BLK/BLUE wired plug located at the rear of the clutch cover / electrical center cover.

When using oxygenated fuel, or when unsure of the fuel type inside the fuel tank, plug the 10% ETHANOL/24 OHM resistor into the fuel selector plug.

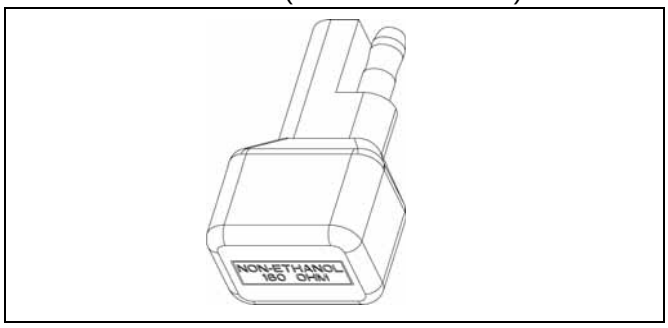
When using non-oxygenated, 91 or higher octane fuel, install the NON-ETHANOL/160 OHM resistor into the fuel selector plug.



10% ETHANOL/24 OHM Resistor Plug
Part Number =2411280 (Installed at the factory.)



NON-ETHANOL/160 OHM Resistor Plug
Part Number =2411282 (Included in tool kit.)



CFI RPM/Engine Speed Limit Modes

RPM/Speed Limit Modes

MODELS	THRESHOLD/ FUNCTION	RPM/SPEED LIMIT
600/700/800 CFI 600 IQ Widetrak	PERC Reverse Enabled	6,000 RPM 9 MPH
600/700/800 CFI 600 IQ Widetrak	Overheat Lamp ON	Hot Lamp Illuminates*: Idle = 230° F/110° C WOT = 185° F/85° C
	Engine Overheat Shutdown	RPM Misfire* at: Idle = 239° F/115° C WOT = 208° F/98° C
600 IQ Widetrak	FWD w/Low Gear Selected	6,750 RPM 43 - 48 MPH
800 CFI 600 IQ Widetrak	DET Protection	6,000 RPM Misfire Turn off engine to reset.

NOTE: * = Temperature values given for Idle and wide open throttle (WOT) operation only. Temperature values between idle and WOT vary and are dependent on engine RPM and throttle position.

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CFI Diagnostic Trouble Codes (DTCs)

TROUBLE CODE	P CODE	MFD BLINK CODE	DESCRIPTION
Throttle Position Sensor Unrealistic Transition	P0120	1	TPS signal changes too rapidly to be correct. Can be caused by faulty connections or a faulty TPS.
Throttle Position Sensor Voltage High	P0123		TPS signal is above 4.39 VDC. Can be caused by a faulty wire connection or faulty TPS.
Throttle Position Sensor Voltage Low	P0122		TPS signal is below 0.7 VDC. Can be caused by a faulty wire connection or faulty TPS.
Engine Coolant Temperature Sensor Voltage High	P0118	2	Sensor signal is above 4.8 VDC. Can be caused by a faulty wire connection or faulty temperature sensor.
Engine Coolant Temperature Sensor Voltage Low	P0117		Sensor signal is below 0.1 VDC. Can be caused by a faulty wire connection or faulty temperature sensor.
Intake Air Temperature Circuit Voltage High	P0113	3	Sensor signal is above 4.9 VDC. Can be caused by a faulty wire connection or faulty P.
Intake Air Temperature Circuit Voltage Low	P0112		Sensor signal is below 0.19 VDC. Can be caused by a faulty wire connection or faulty TMAP.
Barometric Pressure Sensor Voltage High	P0108	4	Sensor signal is above 3.23 VDC. Can be caused by a faulty wire connection or faulty TMAP.
Barometric Pressure Sensor Voltage Low	P0107		Sensor signal is below 1.25 VDC. Can be caused by a faulty wire connection of faulty TMAP.
Exhaust Temperature Sensor Circuit Voltage High	P0546	5	Sensor signal is above 4.9 VDC for at least 2 minutes and the engine has been running at or above 3000 RPM.
Exhaust Temperature Sensor Circuit Voltage Low	P0545		Sensor signal is below 0.06 VDC for at least 2 minutes and the engine has been running at or above 3000 RPM.
Detonation Sensor Circuit Voltage High	P0328	6	Engine speed is above 6000 RPM and the sensor signal is above 4.3 VDC for at least 2 seconds.
Detonation Sensor Circuit Voltage Low	P0327		Engine speed is above 6000 RPM and the sensor signal is below 1.23 VDC for at least 2 seconds.
Exhaust Valve Solenoid Circuit Malfunction	P1477	8	Solenoid control circuit is OPEN. Can be caused by faulty wiring, solenoid, or ECU.
MAG Crankcase Injector Circuit Open	P0261	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
MAG Cylinder Port Injector Circuit Open	P1261		
PTO Crankcase Injector Circuit Open	P0264		
PTO Cylinder Port Injector Circuit Open	P1264		
Fuel Injector Voltage Too High	P2148		Engine is running, but the injector voltage is above the acceptable limit. Can be caused by faulty wiring, ECU or stator.
Fuel Injector Voltage Too Low	P2147		Engine is running, but the injector voltage is below the acceptable limit. Can be caused by faulty wiring, ECU or stator.
MAG Ignition Coil Circuit Malfunction	P0351	9	Failure within the primary circuit. Can be caused by faulty wiring, ignition coil, or ECU.
PTO Ignition Coil Circuit Malfunction	P0352		
5 Tooth CPS Signal Missing	P0335	10	Engine is running, but there is no signal from the 5 tooth CPS. Can be caused by a faulty stator, wiring or ECU.
5 Tooth CPS Signal Intermittent	P0336	Steady LED	Engine is running, but the pulses from the 5 tooth CPS are incorrect. Can be caused by a faulty stator, wiring harness or there is no 2 tooth CPS signal. If there is no 2 tooth CPS signal, the engine will not run, but the P0336 code will be set because the ECU receives extra 5 tooth signals without any 2 tooth signals.
5 VDC Sensor Supply Voltage Low	P0643		Sensor supply voltage is below an acceptable limit. Can be caused by faulty wiring or ECU.
Chassis Voltage High	P0563		System voltage is too high. Can be caused by faulty wiring or regulator / rectifier.
Chassis Voltage Low	P0562		System voltage is too low. Can be caused by a faulty wiring or regulator rectifier.
Ignition Voltage Circuit Malfunction	P0350		Engine is running but a problem is found with the ignition coil power circuit. Can be caused by faulty wiring or ECU.
Chassis Relay Coil Open Circuit	P1611		The chassis relay control circuit is open. Can be caused by faulty wiring or a faulty relay.

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DC-CFI Diagnostic Trouble Codes (DTCs)

TROUBLE CODE	SPN	FMI	P CODE	MFD BLINK CODE	DESCRIPTION
Throttle Position Sensor Unrealistic Transition	51	10	P0120	1	TPS signal changes too rapidly to be correct.
Throttle Position Sensor Voltage High		3	P0123		TPS signal is above 4.39 VDC.
Throttle Position Sensor Voltage Low		4	P0122		TPS signal is below 0.7 VDC.
Engine Coolant Temperature Sensor Voltage High	110	3	P0118	2	Sensor signal is above 4.8 VDC.
Engine Coolant Temperature Sensor Voltage Low		4	P0117		Sensor signal is below 0.1 VDC.
Coolant Temperature Too High		16	P0217		(600 IQ Widetrak Only) Code is set and occurrences accumulated (counted) in ECU whenever engine temperature hot lamp is illuminated.
Engine Overheat Shutdown (Misfire)		0	P1217		(600 IQ Widetrak Only) Code is set and occurrences accumulated (counted) in ECU whenever ECU enables engine overheat misfire mode.
Intake Air Temperature Circuit Voltage High	105	3	P0113	3	Sensor signal is above 4.9 VDC.
Intake Air Temperature Circuit Voltage Low		4	P0112		Sensor signal is below 0.19 VDC.
Barometric Pressure Sensor Voltage High	108	3	P0108		Sensor signal is above 3.23 VDC.
Barometric Pressure Sensor Voltage Low		4	P0107		Sensor signal is below 1.25 VDC.
Exhaust Temperature Sensor Circuit Voltage High	173	3	P0546	5	Sensor signal is above 4.9 VDC for at least 2 minutes and the engine has been running at or above 3000 RPM.
Exhaust Temperature Sensor Circuit Voltage Low		4	P0545		Sensor signal is below 0.06 VDC for at least 2 minutes and the engine has been running at or above 3000 RPM.
Detonation Sensor Circuit Voltage Low	731	4	P0328	6	Engine speed is above 6000 RPM and the sensor signal is above 4.3 VDC for at least 2 seconds.
Knock Level (MAG)	1352	0	P1336		Maximum Detonation Correction Limit Reached
		16	P2336		Knock above critical level.
Knock Level (PTO)	1353	0	P1337		Maximum Detonation Correction Limit Reached
		16	P2337		Knock above critical level.
MAG Cylinder Port Injector Circuit	651	5	P0261	7	OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
		3	P0262		Circuit shorted to battery voltage.
PTO Cylinder Port Injector Circuit	652	5	P0264		OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
		3	P0265		Circuit shorted to battery voltage.
MAG Crankcase Injector Circuit	520216	5	P1261		(600 IQ Widetrak Only) OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
		3	P1263		(600 IQ Widetrak Only) Circuit shorted to battery voltage.
PTO Crankcase Injector Circuit	520217	5	P1264		(600 IQ Widetrak Only) OPEN circuit or short to ground. Can be caused by faulty wiring, injector, stator or ECU.
		3	P1265		(600 IQ Widetrak Only) Circuit shorted to battery voltage.
Exhaust Valve Solenoid	520215	5	P1477	8	Solenoid control circuit is OPEN. Can be caused by faulty wiring, solenoid, or ECU.
		3	P1479		Circuit shorted to battery voltage.
Ignition Coil Circuit Malfunction	1268	5	P1351	9	Failure within the primary circuit. Can be caused by faulty wiring, ignition coil, or ECU.
Crankshaft Position Sensor	636	8	P0336	10	Circuit fault.
		2	P0335		Plausibility fault.

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TROUBLE CODE	SPN	FMI	P CODE	MFD BLINK CODE	DESCRIPTION
Vehicle Speed Sensor	84	1	P0502		Indicated vehicle speed to low.
		2	P0503		Data erratic or intermittent (missing).
Fuel Pump Driver Circuit	1347	5	P0230		Drive circuit open or shorted to ground.
ECU Memory	628	13	P0601		Checksum / CRC Error
Alternator Power Supply	167	3	P1569		Chassis voltage too high.
		4	P1568		Chassis voltage too low.
Sensor Supply Voltage 1	3509	4	P06B1		Voltage too low.
Sensor Supply Voltage 2	3510		P06B4		
ECU Output Supply Voltage	3598	3	P16A9		Voltage too high.
		4	P16A8		Voltage too low.
Throttle Safety Signal	520194	3	P1555		Voltage too high.
		4	P1554		Voltage too low.
		7	P1552		Throttle is stuck.
Fuel Type Selected	524007	3	P0179		Voltage too high.
		4	P0178		Voltage too low.
		2	P0177		(600 IQ Widetrak Only) Signal Out of Range
Chassis Relay Circuit Open/Grounded	520208	5	P1611		(600 IQ Widetrak Only)
Chassis Relay Driver Shorted to Battery Voltage		3	P1614		(600 IQ Widetrak Only)

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MFD Blink Codes

The check engine LED will display a blink code whenever the ECU determines there is a current problem with one or more of the sensors. Use Digital Wrench to troubleshoot, fix and clear the codes.

When a blink code is displayed, the CHECK ENGINE light will illuminate for 1/2 second “on” and 1/2 second “off” with a 1 second “off” interval between close, except for exhaust temperature sensor codes where the engine has to run over 3000 RPM for 60 to 90 seconds depending on model to trigger a blink code.

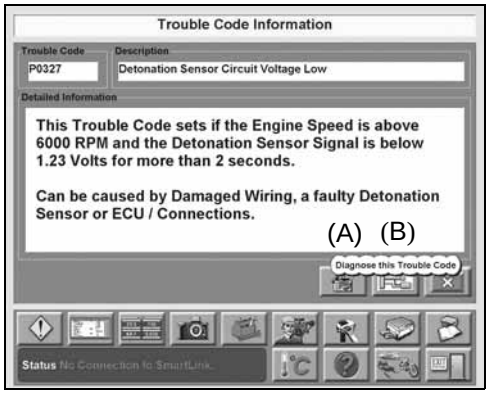
DTC Troubleshooting

Always use the Digital Wrench diagnostic software program to troubleshoot DTCs, MFD blink codes, and overall performance problems.

Digital Wrench can be used to display trouble codes and offers guided diagnostics. Guided diagnostics allows the technician to perform diagnostic checks in an attempt to isolate the root problem.

1. To access trouble codes, click on the “!” button. If any codes are listed, select a code to proceed.

2. To access guided diagnostics, click on the “SPECIAL TESTS” (toolbox) button. Then click “DIAGNOSTIC PROCEDURES”.
3. Select a code or system in the ‘SYSTEM CHARTS” menu. A description of the DTC or system will be displayed.


Trouble Code Information
Trouble Code
P0327
Description
Detonation Sensor Circuit Voltage Low
Detailed Information
This Trouble Code sets if the Engine Speed is above 6000 RPM and the Detonation Sensor Signal is below 1.23 Volts for more than 2 seconds.
Can be caused by Damaged Wiring, a faulty Detonation Sensor or ECU / Connections.
(A) (B)
Diagnose this Trouble Code
Status No Connection to SmartLink

4. Click on (A) to activate guided diagnostics.
5. Click on (B) to view a wiring schematic of the component or system.
6. Click on “X” to exit the current screen.

4

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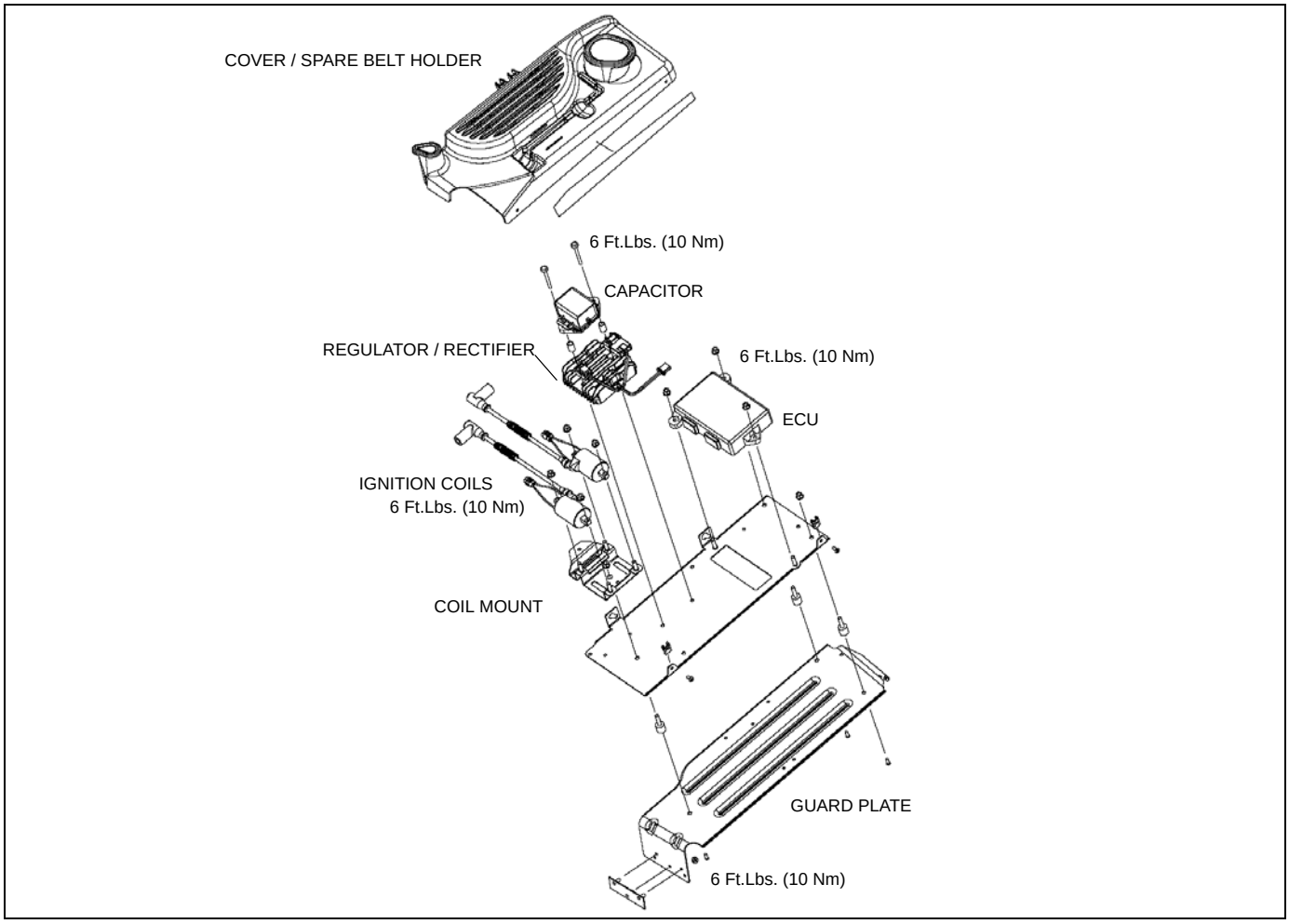
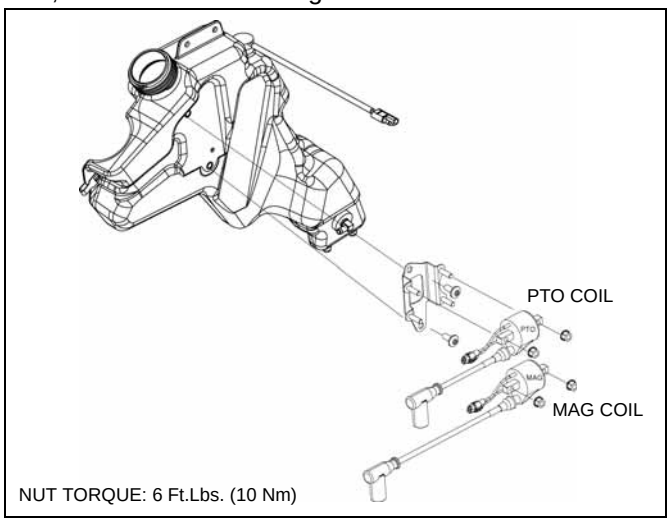
CFI Clutch Guard Electrical Center



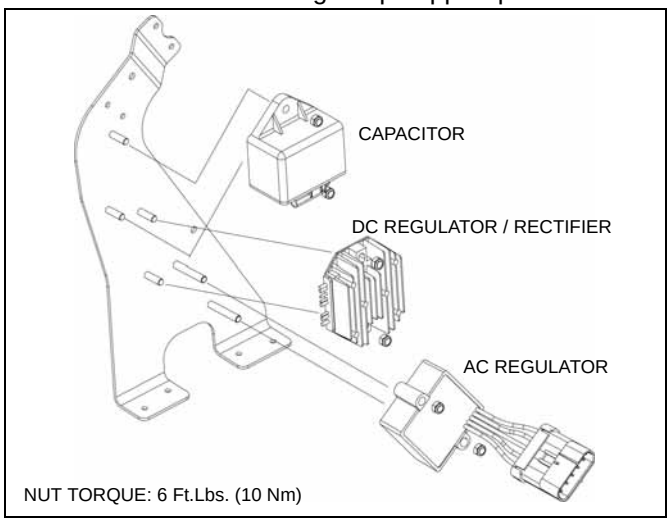
DC-CFI/600 IQ Widetrak Ignition Coil Mount

The ignition coils on DC-CFI models are mounted to the oil tank, not within the clutch guard.



600 IQ Widetrak Electrical Center

The AC regulator, DC regulator/rectifier, and capacitor are mounted to the RH steering hoop support plate.



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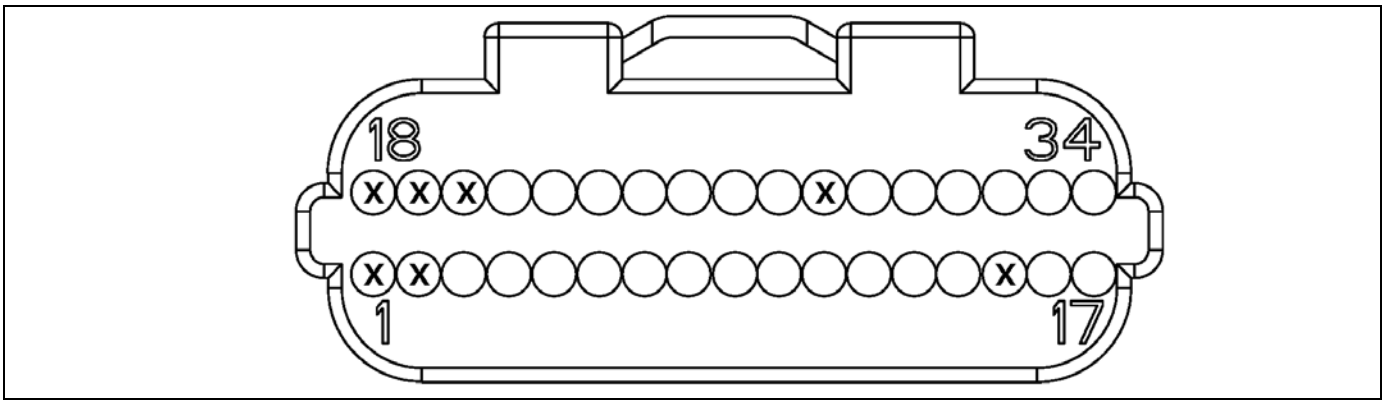
2007 CFI 34 Pin CNA ECU Connector



NOTE: Wire Entry View

PIN	COLOR	GOES TO CONNECTOR	FUNCTION
3	RED/BLUE	SPLICE	K LINE POWER
4	ORANGE	ECU POWER	EXTERNAL POWER
5	WHITE/BLACK	EXHAUST TEMP. SENSOR	SIGNAL
6	BLUE	TMAP	AIR TEMP SIGNAL
7	GREEN/BLUE	IGNITION SWITCH	STARTER LOCKOUT
8	RED/WHITE	TMAP	5 VDC POWER SUPPLY
9	GREEN/RED	GROUND SPEED SENSOR SPLICE	SPEED SIGNAL
10	RED/BLACK	ELECTRIC START	BATTERY VOLTAGE
11	WHITE/BLUE	CHASSIS RELAY	COIL GROUND
12	RED/BLACK	THROTTLE FLIPPER SAFETY SWITCH	SOFTWARE BASED IGNITION KILL SIGNAL
13	BROWN	ECU GROUND SPLICE	ECU GROUND
14	RED/BLUE	CHASSIS / HOOD #2	WATER TEMP. SIGNAL
16	YELLOW/RED	CHASSIS / HOOD #1	TACHOMETER SIGNAL
17	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER
21	PINK	DIAGNOSTIC	K-LINE
22	GRAY	GRAY SPLICE	MODE SELECT
23	WHITE	CHASSIS/HOOD #1	PERC LED
24	GREEN	TMAP	PRESSURE SENSOR SIGNAL
25	BLUE/WHITE	CHASSIS / HOOD #1	OVERHEAT / DET LED
26	ORANGE/GREEN	ELECTRIC START	CHARGE RELAY COIL GROUND
27	BLACK/WHITE	DIAGNOSTIC SPLICE - CHASSIS / HOOD #1	DIAGNOSTICS / CHECK ENGINE LED
29	BLACK	TETHER / IGN. SWITCH / SAFETY SLAP SWITCH	HARDWARE STOP - IGNITION KILL SIGNAL
30	BLACK/BLUE	SENSOR GROUND SPLICE #1	SENSOR GROUND
31	GRAY	LH CONTROL	PERC SIGNAL
32	RED	REGULATOR POWER SPLICE	REGULATED POWER
33	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER
34	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER

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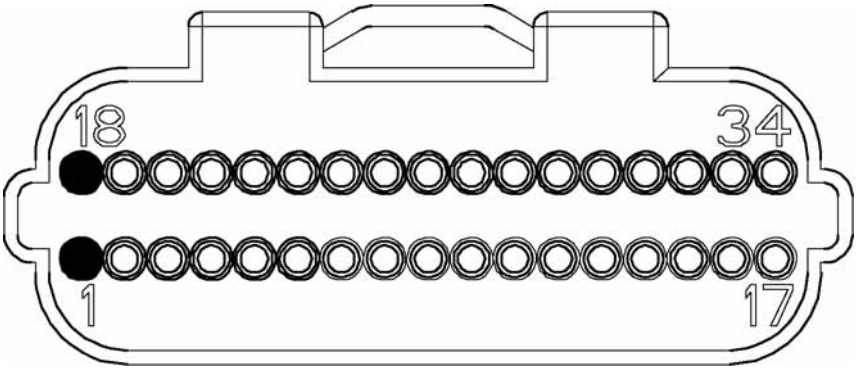
2008 - 2010 CFI 34 Pin CNA ECU Connector



NOTE: Wire Entry View

PIN	COLOR	GOES TO CONNECTOR	FUNCTION
3	RED/BLUE	SPLICE	K LINE POWER
4	ORANGE	ECU POWER	EXTERNAL POWER
5	WHITE/BLACK	EXHAUST TEMP. SENSOR	SIGNAL
6	BLUE	TMAP	AIR TEMP SIGNAL
7	GREEN/BLUE	IGNITION SWITCH	STARTER LOCKOUT
8	RED/WHITE	TMAP	5 VDC POWER SUPPLY
9	GREEN/RED	GROUND SPEED SENSOR SPLICE	SPEED SIGNAL
10	RED/BLACK	ELECTRIC START	BATTERY VOLTAGE
11	WHITE/BLUE	CHASSIS RELAY	COIL GROUND
12	RED/BLACK	THROTTLE FLIPPER SAFETY SWITCH	SOFTWARE BASED IGNITION KILL SIGNAL
13	BROWN	ECU GROUND SPLICE	ECU GROUND
14	RED/BLUE	CHASSIS / HOOD #2	WATER TEMP. SIGNAL
16	YELLOW/RED	CHASSIS / HOOD #1	TACHOMETER SIGNAL
17	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER
21	PINK	DIAGNOSTIC	K-LINE
22	GRAY	GRAY SPLICE	MODE SELECT
23	WHITE	CHASSIS/HOOD #1	PERC LED
24	GREEN	TMAP	PRESSURE SENSOR SIGNAL
25	BLUE/WHITE	CHASSIS / HOOD #1	OVERHEAT / DET LED
26	ORANGE/GREEN	ELECTRIC START	CHARGE RELAY COIL GROUND
27	BLACK/WHITE	DIAGNOSTIC SPLICE - CHASSIS / HOOD #1	DIAGNOSTICS / CHECK ENGINE LED
29	BLACK	TETHER / IGN. SWITCH / SAFETY SLAP SWITCH	HARDWARE STOP - IGNITION KILL SIGNAL
30	BLACK/BLUE	SENSOR GROUND SPLICE #1	SENSOR GROUND
31	GRAY	LH CONTROL	PERC SIGNAL
32	RED	REGULATOR POWER SPLICE	REGULATED POWER
33	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER
34	ORANGE	REGULATOR / RECTIFIER	VOLTAGE BOOST POWER

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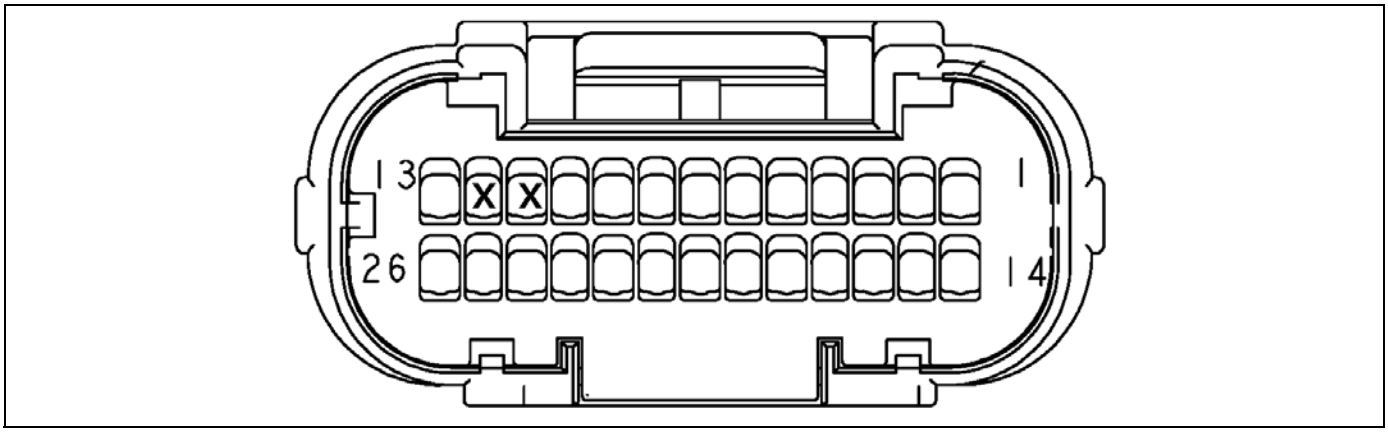
2007 - 2010 CFI 26 Pin CNB ECU Connector



NOTE: Wire Entry View

PIN	COLOR	GOES TO CONNECTOR	FUNCTION
1	ORANGE	PTO IGNITION COIL	COIL POWER
2	BLUE / YELLOW	STATOR - FUEL INJECTOR COIL	FUEL INJECTOR POWER COIL
3	BLUE / YELLOW	STATOR - FUEL INJECTOR COIL	FUEL INJECTOR POWER COIL
4	GREEN	STATOR - CRANK POSITION SENSOR	5 TOOTH COIL SIGNAL
5	WHITE	STATOR - CRANK POSITION SENSOR	2 TOOTH COIL SIGNAL
6	YELLOW	MAG FULL LOAD INJECTOR	INJECTOR CONTROL GROUND
7	YELLOW / WHITE	MAG PART LOAD INJECTOR	INJECTOR CONTROL GROUND
8	GREEN	PTO FULL LOAD INJECTOR	INJECTOR CONTROL GROUND
9	GREEN / WHITE	PTO PART LOAD INJECTOR	INJECTOR CONTROL GROUND
10	RED / WHITE	TPS	5 VDC POWER SUPPLY
13	WHITE / YELLOW	EV SOLENOID	SOLENOID CONTROL GROUND
14	BROWN	MAG IGNITION COIL/STATOR/STATOR	GROUND
15	GREEN / RED	STATOR - EXCITER COIL	EXCITER COIL
16	GREEN / YELLOW	STATOR - EXCITER COIL	EXCITER COIL
17	WHITE / GREEN	CRANK POSITION SENSOR	5 TOOTH COIL GROUND
18	WHITE / RED	CRANK POSITION SENSOR	2 TOOTH COIL GROUND
19	BLACK / BLUE	DETONATION SENSOR	GROUND
20	PURPLE	DETONATION SENSOR	SENSOR SIGNAL
21	RED / BLUE	MAG / PTO FULL LOAD INJECTOR	INJECTOR POWER SUPPLY
22	RED / BLUE	MAG / PTO PART LOAD INJECTOR	INJECTOR POWER SUPPLY
23	AQUA	TPS	SENSOR SIGNAL RETURN
24	BLACK / BLUE	COOLANT TEMP. SENSOR / TPS	SENSOR GROUND
25	YELLOW	COOLANT TEMP. SENSOR	SENSOR SIGNAL RETURN
26	RED	EV SOLENOID	REGULATED VOLTAGE

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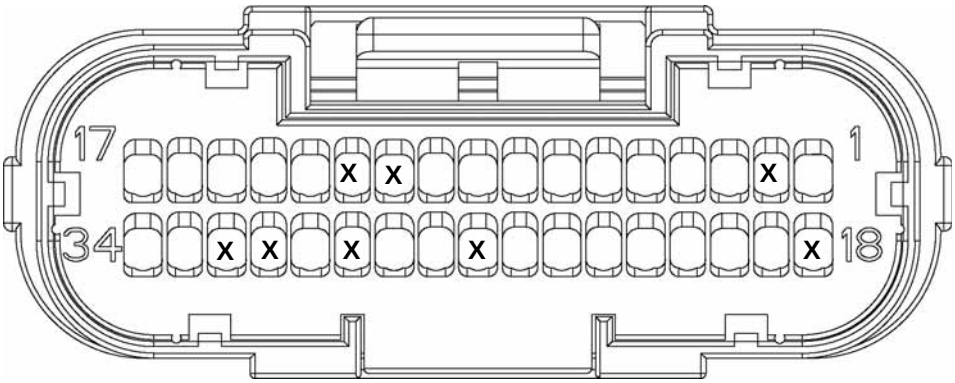
2009 - 2010 DC-CFI 34 Pin CNA ECU Connector



NOTE: Wire Entry View

PIN	COLOR	GOES TO CONNECTOR	FUNCTION
1	DG/WHT	IGNITION SWITCH	STARTER LOCKOUT
3	RD/BLK	ELECTRIC START	BATTERY VOLTAGE
4	YEL/RD RD/YEL (600 WIDETRAK ONLY)	CHASSIS/HOOD	TACHOMETER
5	DB/WHT		HOT LED INDICATOR
6	BLK/WHT		CHECK ENGINE LED (MIL)
7	BLK/DB	SENSOR GROUND SPLICE	SENSOR GROUND
8	DG/RD	GROUND SPEED SPLICE	GROUND SPEED SIGNAL
9	BLACK	IGNITION SWITCH	HARD STOP SWITCH
10	GREY	LH CONTROL SIGNAL PLUG	PERC SWITCH
14	PK/BLK	FUEL MODE PLUG	FUEL QUALITY SWITCH
13	WHT/DB (600 WIDETRAK ONLY)	GEARCASE LOW RANGE SWITCH	LOW GEAR SIGNAL
15	BROWN	ECU GROUND SPLICE	ECU GROUND
16	BROWN		
17	ORANGE	EXTERNAL POWER SPLICE	EXTERNAL POWER
19	BN/YEL	FUEL PUMP PRIME GROUND SPLICE	FUEL PUMP ON/OFF CONTROL
20	ORANGE	VOLTAGE BOOST	FUEL INJECTION VOLTAGE BOOST
21	ORANGE		
22	DB/RED	CHASSIS HOOD	WATER TEMP. SIGNAL
23	WHITE		REVERSE LED SIGNAL
24	YEL/BLK (600 WIDETRAK ONLY)	FAN RELAY	FAN RELAY CONTROL
25	BK/RED	THROTTLE SAFETY SWITCH	THROTTLE SOFT STOP
27	DARK GREEN	CAN LOW	CAN LOW SIGNAL
28	YELLOW	CAN HIGH	CAN HIGH SIGNAL
30	WHT/YEL	EV SOLENOID	SOLENOID ON/OFF CONTROL
33	WHT/DB	CHASSIS POWER RELAY	RELAY COIL ON/OFF CONTROL
34	RED	REGULATOR POWER SPLICE	DC REGULATED VOLTAGE

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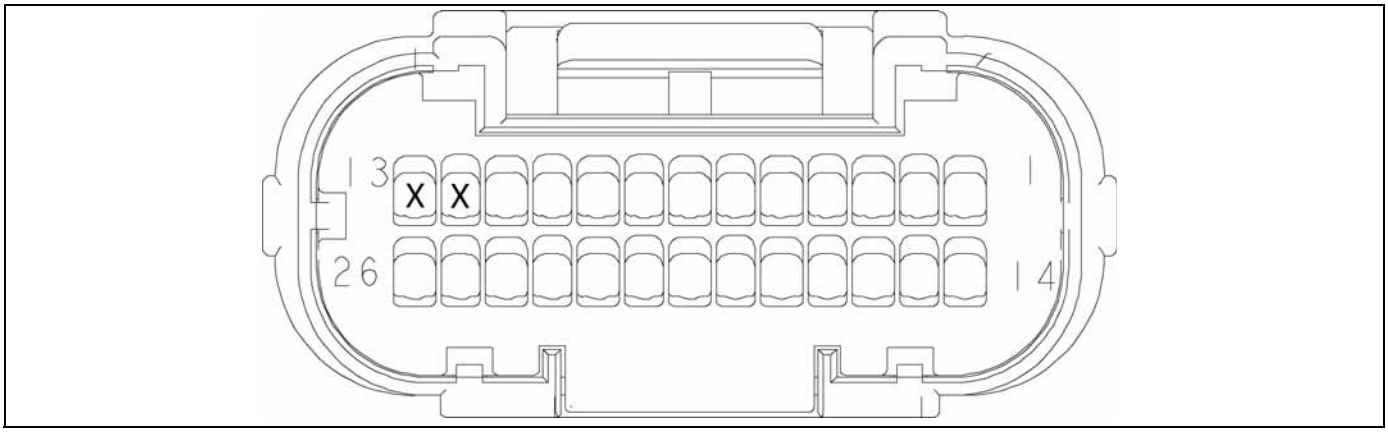
2009 - 2010 DC-CFI 26 Pin CNB ECU Connector



NOTE: Wire Entry View

PIN	COLOR	GOES TO CONNECTOR	FUNCTION
1	BLUE	FUEL INJECTOR HARNESS PLUG	PTO FULL LOAD INJECTOR
2	BLU/WHT		PTO PART LOAD INJECTOR
3	RD/BLU		FUEL INJECTOR POWER SUPPLY
4	GREEN	5 TOOTH CPS SENSOR	SENSOR SIGNAL
5	BRN/WHT (WHT/RED) / (WHT/GRN)	STATOR CPS HARNESS CONNECTOR	SENSOR GROUND
6	BLK/BLU	TPS CONNECTOR EXHAUST TEMP. SENSOR COOLANT TEMP. SENSOR TMAP SENSOR CONNECTOR COMMUNICATION CONNECTOR	SENSOR GROUND
7	AQUA (BLUE)	TPS CONNECTOR	TPS SIGNAL RETURN
8	YEL/RED	COOLANT TEMP. SENSOR	COOLANT TEMP. SIGNAL
9	BLK/WHT	DETONATION SENSOR	SIGNAL GROUND
10	YEL/WHT	COMMUNICATION CONNECTOR	TxD SIGNAL
11	WHT/BLK		RxD SIGNAL
14	YELLOW	FUEL INJECTOR HARNESS PLUG	MAG FULL LOAD INJECTOR
15	YEL/WHT		MAG PART LOAD INJECTOR
16	RED/BLU		FUEL INJECTOR POWER
17	WHITE	2 TOOTH CPS SENSOR	SENSOR SIGNAL
18	RED	IGNITION COIL CONNECTOR	COIL POWER
19	BLACK		COIL GROUND
20	GREY	TMAP SENSOR CONNECTOR	INTAKE PRESSURE SIGNAL
21	ORANGE	STATOR SYSTEM POWER CONNECTOR	FUEL INJECTOR BOOST POWER
22	WHT/BLK	EXHAUST TEMP. SENSOR	EXHAUST TEMP. SIGNAL
23	PINK	TMAP SENSOR CONNECTOR	INTAKE AIR TEMP. SIGNAL
24	RED/WHT	TPS CONNECTOR TMAP SENSOR CONNECTOR COMMUNICATION CONNECTOR	5VDC SENSOR VOLTAGE
25	PURPLE (VIOLET)	DETONATION SENSOR	SENSOR SIGNAL
26	ORANGE	STATOR SYSTEM POWER CONNECTOR	FUEL INJECTOR POWER

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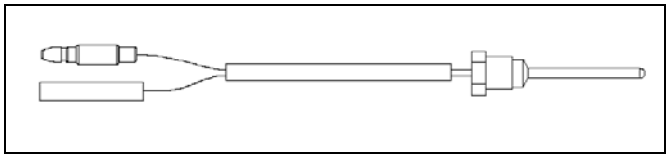
Exhaust Temperature Sensor

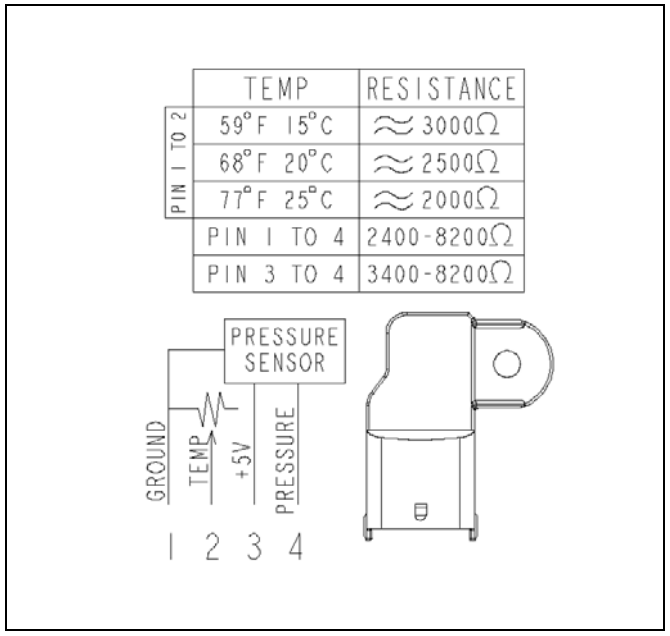


Sensor Specifications

Resistance Values	2.3MΩ @ 392_F (200_C) - 76Ω @ 1652_F (900_C)

= T
Exhaust Temperature Sensor Torque 32 Ft.Lbs. (44 Nm)

Temperature / Air Pressure Sensor (TMAP)



Sensor Specifications

Pins 1 to 2 (Temperature)	59_F (15_C) = 3000Ω 68_F (20_C) = 2500Ω 77_F (25_C) = 2000Ω
Pins 1 to 4 (Pressure) Pins 3 to 4 (Pressure)	2400 - 8200Ω 3400 - 8200Ω

Crankshaft Position Sensors (CPS)

The 5 tooth crank position sensor picks up all 5 flywheel teeth and determines the following:

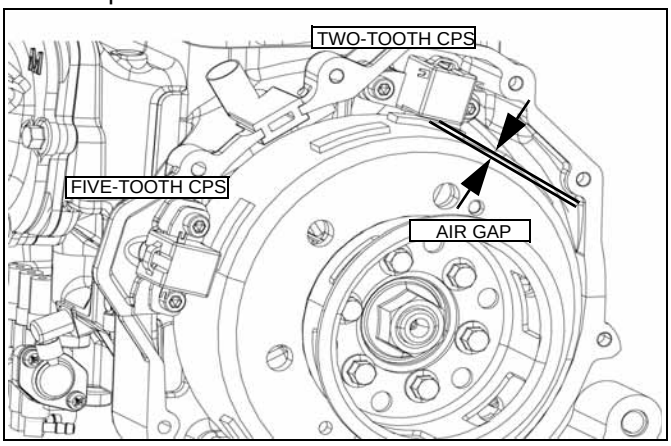
- Judge direction of rotation (forward and backward)
- Ignition advance angle control
- Injector drive angle control
- Excess advance ignition control at reverse
- MAG / PTO cylinder detection

The 2 tooth crank position sensor picks up 2 flywheel teeth. It detects the crank angle and obtains minimal information of the crank angle when control enters into limp home mode

The sensors must be in the correct position or the engine will not run. A sheared flywheel key will cause the engine to not start or to shut off (misfire).

Crankshaft Position Sensor Air Gaps

Hard engine starting, erratic reverse operation, and poor engine performance can occur if the CPS air gap(s) are outside specification.



NOTE: The sensor bases are not slotted. Only minor deflection adjustments can be made.

= In. / mm.
Crankshaft Position Sensor Air Gap .020"-.030" (0.5-0.8mm)

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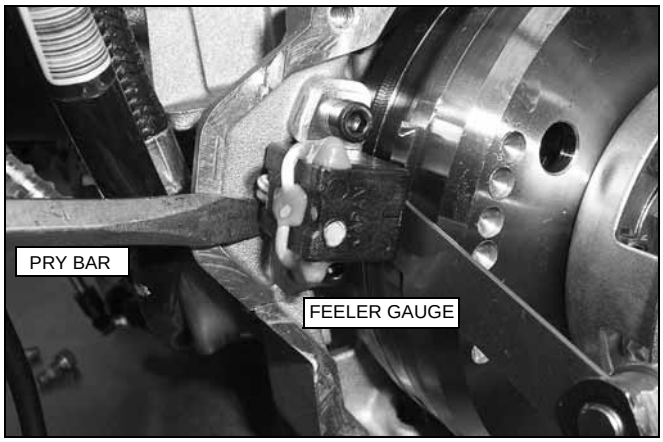
Air Gap Inspection/Adjustment

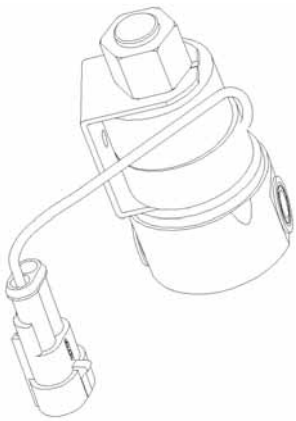
1. Rotate the crankshaft/flywheel so that an encoder rib is positioned directly underneath the sensor being measured.
2. Insert the blade of a .030" feeler gauge between the rib and sensor face. If there is no drag felt on the feeler gauge, the CPS must be adjusted.
3. To adjust a CPS, use a 8 inch pry bar to carefully deflect the sensor.
4. Place the tip of the small pry bar between the back of the sensor and crankcase. insert a .012" feeler gauge between the sensor face and encoder rib.

IMPORTANT: Do not pry on the individual sensor wires.



5. Gently pry the sensor towards the encoder rip until the gauge begins to bind between the components.
6. Re-measure the air gap. The gap should be between .020"-.030".

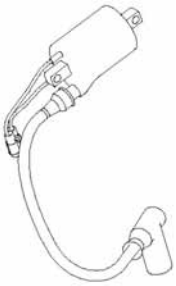
Exhaust Valve Solenoid



Specifications

Coil Resistance (WHT/YEL to RED)	15Ω +/- 15% @ 68°F (20°C)

CFI Ignition Coils



Specifications

Primary Coil Resistance (Black to White)	0.45Ω +/- 15% @ 68°F (20°C)
Secondary Coil Resistance (Without Plug Cap) (Black to High Tension Lead)	18,000Ω +/- 15% @ 68°F (20°C)
Plug Cap Resistance	4,000Ω - 6,000Ω

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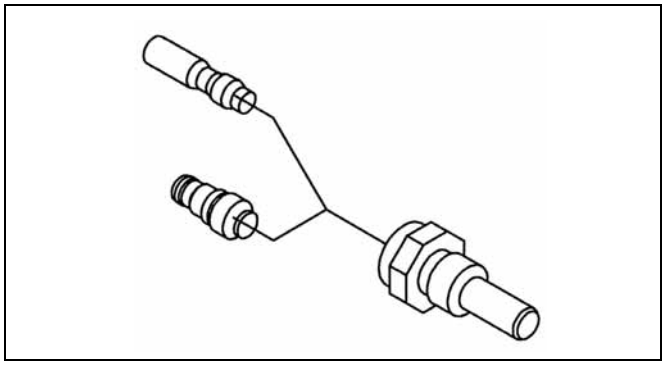
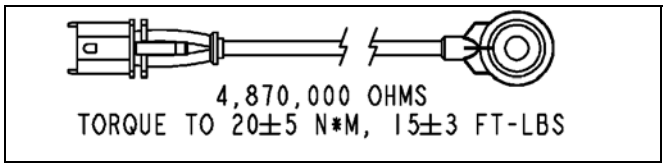
Engine Coolant Temperature Sensor



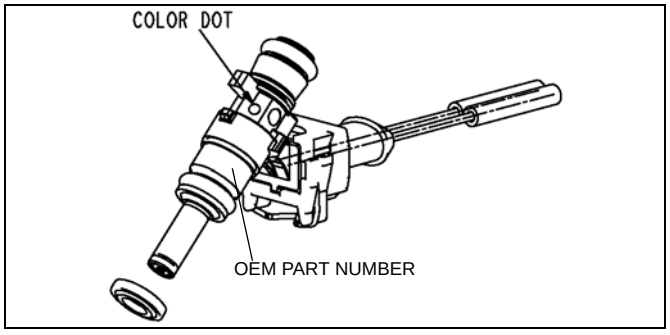
Sensor Specifications

Operating Temperature Range	-22_F - +248 _F (-30_C - 120_C)
Resistance	2.4 - 2.6KΩ@ 68_F (20_C) (Measure in stirred water)
Installation Torque	29 ft.lbs. (39.2Nm)

Knock Sensor



Fuel Injectors

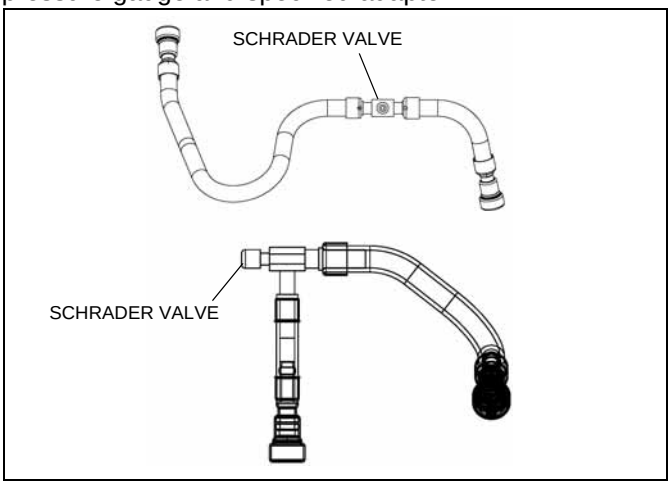


Specifications

Resistance	12Ω @ 68_F (20_C)

Fuel Rail Bleeding / Pressure Testing

All CFI engine fuel return hoses feature an inline Schrader valve that can be used to bleed the fuel system pressure and observe fuel system pressure when using the fuel pressure gauge and specified adapter.

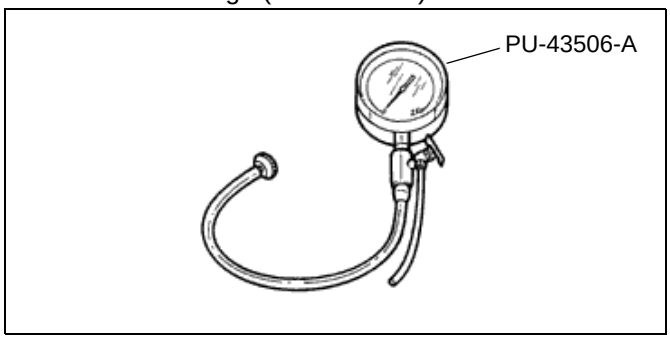


The model year and engine model will determine which fuel pressure tool adapter is required to complete both tasks.

Fuel Pressure Gauge/Adapters

YEAR / MODEL	ADAPTERS	GAUGE/ BLEED TOOL
Select 2007-2011 600 CFI Shallow Core	314249 (.305-32 Shallow Core fitting supplied with PU-43506-A)	PU-43506-A
2007 600 CFI Deep Core	PS-48617 (.305-32 Deep Core fitting)	
Select 2008-2011 600s All 700s/800s	PS-48762 (7/16-20 fitting)	

Fuel Pressure Gauge (PU-43506-A)



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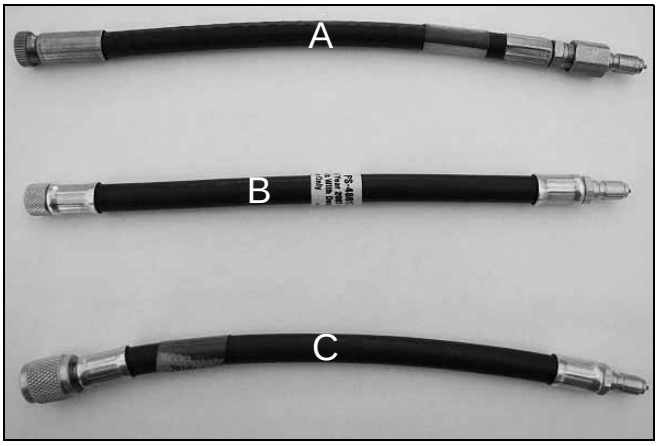
Fuel Pressure Gauge Adapters



- A = 314249 (.305-32 shallow core fitting/adapter supplied with PU-43506-A Fuel Pressure Gauge)
- B = PS-48617 (.305-32 deep core fitting)
- C = PS-48762 (7/16-20 fitting)

1. Select the appropriate adapter.
2. Connect the adaptor to the fuel return hose Schrader valve.
3. Connect the adapter to the fuel pressure/bleed tool gauge.
4. To observe running fuel system pressure, start the engine and compare reading to the specification.

NOTE: Observe pressure reading at idle and while operating the vehicle.

= In. / mm.
Fuel System Pressure 58-60 (4.0-4.1)

5. To bleed the fuel system pressure after the engine is stopped, place the tool's bleed hose into an appropriate fuel handling container. Open the valve to release the pressure and drain residual fuel.
6. Close the valve, then remove the gauge and adapter from the fuel hose Schrader valve. Replace the Schrader valve dust cap.

Disconnect Fittings

The fuel hoses feature disconnect fittings that require special tools to remove.

The fuel line disconnect tool kit, PS-47152, supplies both a 5/16″ and a 3/8″ quick disconnect tool. These tools are also commercially available at local auto parts stores.

PS-47152

1. To disconnect a fuel hose from the fuel pump, or fuel rail, insert the tapered end of either the 5/16″ or 3/8″ tool into the female housing.
2. Firmly press the tool into the housing while carefully pulling the male hose out.
3. Reconnect the fuel hoses by coating each hose end with a light film of two stroke engine oil.
4. Carefully install the male end of the hose into the center of the female housing. Firmly push the hoses together until the male nozzle fully seats behind the spring tabs.
5. Grasp both hoses and gently pull to verify positive engagement.

Fuel Tank Pressure Test

1. Connect a Mity VAC hand pump to the fuel tank vent fitting.
2. Connect a eight-inch piece of 5/16″ fuel hose and two gear clamps across the fuel supply and return fittings at the fuel pump flange.
3. Pressurize the tank to 5 PSI.

NOTE: Fuel tank deformation will occur when the tank is pressurized.

⚠ WARNING
Do not over-pressurize the fuel tank past 6 PSI.

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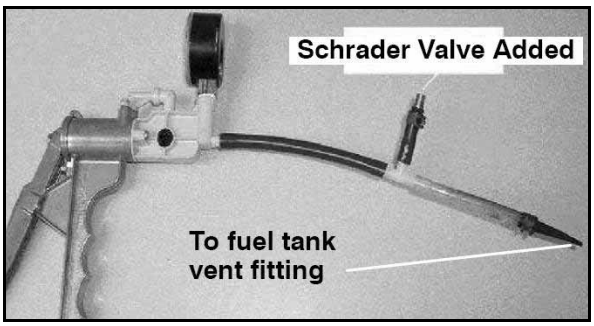
NOTE: Using a hand pump to pressurize the fuel tank may take a very long time. The installation of an in-line Schrader Valve (PN: 2872602) and the use of a low pressure pump (bicycle tire pump) is recommended.

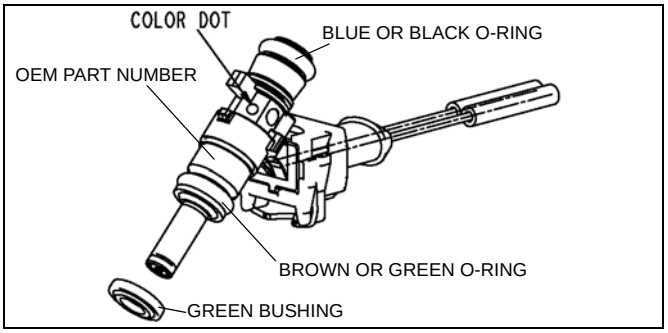


4. Once the tank is pressurized, saturate the area around the PFA gasket with a mixture of water and mild detergent.
5. If any bubbles form, re-check the PFA nut torque. If bubble formation continues, the PFA gasket will have to be replaced, or tank replacement is required.

NOTE: There may be bubbles present from the initial application of leak detector. Slightly blow on the bubbles to pop them. Watch for new bubble formation. New bubble formation may very small so look closely. Apply additional water/detergent solution if required.

Fuel Rail and Injector Removal / Installation

NOTE: Leave protective caps installed until instructed to remove. Avoid touching the tip of the injector.



600/700 INJECTOR KITS

INJECTOR KITS	COLOR
2203894-053	Yellow
2203894-027	Blue
2203894-015	Red

800 INJECTOR KITS

INJECTOR KITS	COLOR
2203575-053	Yellow
2203575-027	Blue
2203575-015	Red

800 fuel injectors are different than 600/700 fuel injectors. A fuel injector, regardless of color code, can be accurately identified by the OEM part number stamped on plastic injector housing.

- 800 = OEM PN 1203628
- 600/700 = OEM PN 1203491

When replacing a faulty fuel injector, always verify the part number of the injector for the engine application and use the same color code. If replacing an injector with a different color code, all of the fuel injectors must be replaced with the new color so all four injectors are the same color.

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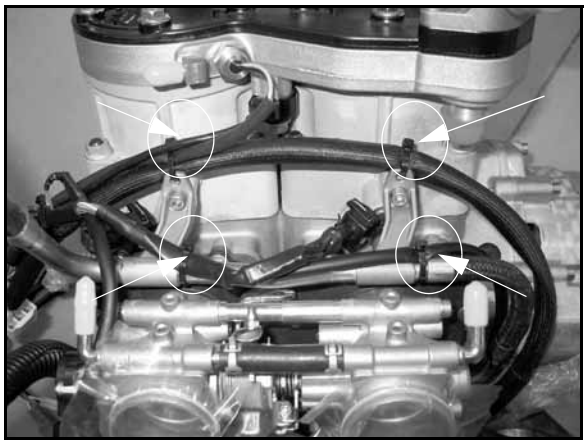
After replacing the injectors, the ECU must be re-flashed so the fuel calibration map matches the new color coded fuel injectors.

⚠ CAUTION

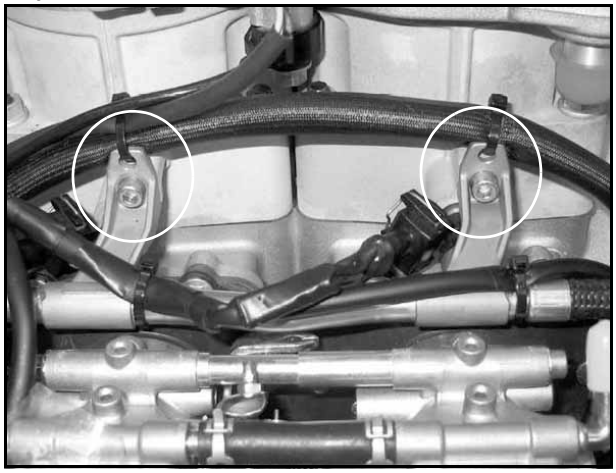
ALWAYS CHECK THE INJECTOR PART NUMBER TO VERIFY ENGINE APPLICATION REGARDLESS OF COLOR CODE.
NEVER RUN THE ENGINE WITH DIFFERENT COLOR-CODED FUEL INJECTORS. SEVERE ENGINE DAMAGE WILL OCCUR.
ALWAYS VERIFY THE ECU CALIBRATION FILE MATCHES THE FUEL INJECTOR COLOR CODE.

1. Depressurize the fuel rail. See “Fuel Rail Bleeding / Pressure Testing” on page 4.38.
2. Remove the panduit straps as shown.



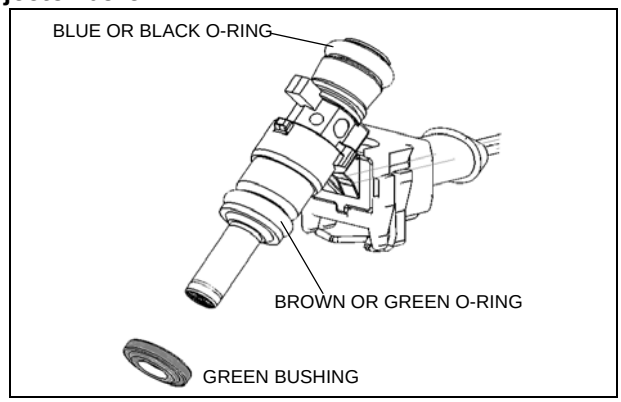
NOTE: The engine must be removed from the engine compartment to access the lower two fuel injectors.

3. Remove the hex screws securing the fuel rail it to the cylinders.

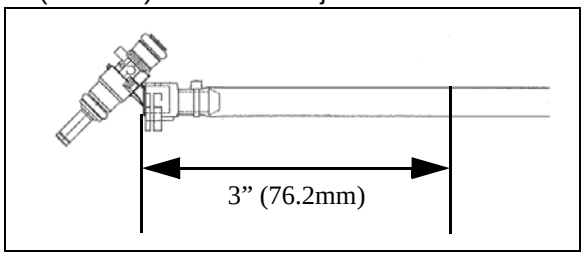


4. If replacing a lower injector, remove the two bottom screws bolts from the lower fuel rail.
5. Remove the failed injector(s).

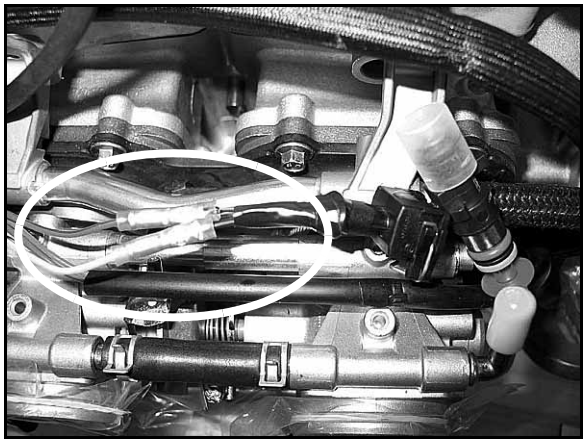
NOTE: Make sure that the green bushing comes out with the injector. If it does not, look inside the injector bore.



6. Measure from the end of the injector (as shown below) 3" (76.2mm) and cut the injector off.



7. Strip the harness end injector wire covering .25" - .375" (6.35 - 9.525mm).
8. Crimp the ends of the new injector firmly on to the wire harness.



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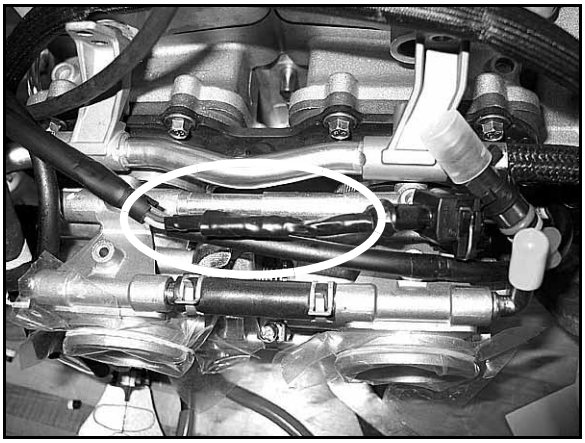
9. Tape exposed wire and splices.



10. Apply oil to the fuel injector o-rings, seal and mating surfaces.
11. Remove the protective caps. Install the injector(s) into the fuel rail. Verify the injector(s) are fully seated.
12. Insert the fuel rail, with injectors into the engine.
13. Apply a light amount of 262 Loctite® to the fuel rail fasteners and torque to specification.

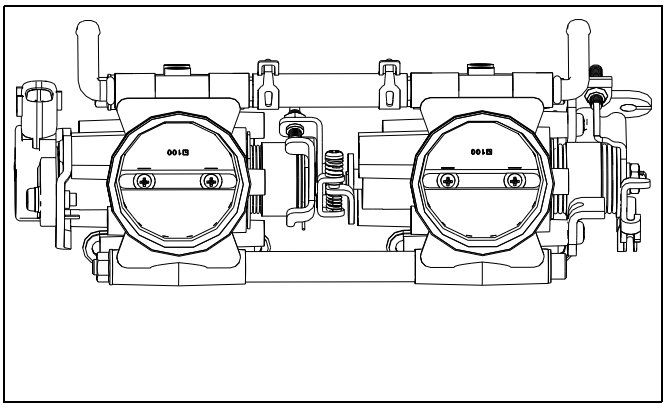
= T
Fuel Rail Hex Screw Torque: 9 ft-lb (12N-m)

14. Replace the harness to the original routing and apply panduit straps back to the original locations, making sure they are not applied over any mesh part of the fuel rail.

NOTE: Refer to Step 2 for proper routing and strap location.

15. Install the engine if it was removed.
16. If different color injectors were installed, re-flash the ECU to the new color code.

Throttle Body/Throttle Position Sensor (TPS)



Throttle Body Removal/Installation:

1. Remove the air box.
2. Remove the throttle body air box adapter if equipped.
3. Pinch off the coolant lines with the hose pincher tool PN PU-45149. Remove the coolant hoses from the throttle body.
4. Loosen the intake boot clamps and pull the throttle body upward to gain access to the throttle cable and TPS connector.
5. Loosen the throttle cable lock nuts and remove the cable from the throttle body.
6. Disconnect the TPS harness connector.
7. Remove throttle body.

NOTE: Service replacement throttle body assemblies have the TPS already installed. No TPS adjustment is required.

8. Reinstall the throttle body assembly. Torque throttle body boot clamps to specification.
9. Turn the throttle cable inline adjuster clockwise until bottom-out.
10. Install throttle cable on to throttle body. Adjust the jam nuts. Verify the throttle cable is not pulling on the throttle plate cam. Tighten jam nuts.
11. Reinstall the cooling hoses and remove the pincher tools.
12. Reinstall the air box adapter plate if equipped. Reinstall the air box assembly.
13. Install the throttle cable into the throttle lever. use the inline adjuster to set the throttle lever free play to specification.

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Throttle Position Sensor (TPS) Overview

⚠ CAUTION

The throttle position sensor (TPS) is set at the time of throttle body manufacture. TPS adjustments should only be made if the TPS was loosened, repositioned, or replaced.
Any adjustments made to the TPS sensor or throttle synchronization screw will require performing the Digital Wrench Full Procedure (TPS Replacement) guided diagnostic.

The throttle position sensor (TPS) is set at the factory based on a throttle body idle air gap flow specification. TPS adjustments should only be performed when replacing the TPS.

NOTE: Follow these guidelines whenever working with the TPS:

- Use Digital Wrench when checking the TPS voltage. Digital Wrench is the only tool that will read/display the actual TPS voltage the engine management system uses to determine throttle plate angle.
- Disconnect the throttle cable from the throttle lever. If the throttle body idle air gap TPS voltage changes after removing the throttle cable from the throttle lever, the throttle cable is too tight and must be readjusted by turning the inline adjuster clockwise.
- Verify the throttle cable is not pulling on the throttle plate cam. Turn the throttle cable inline adjuster clockwise to loosen the cable. If the cable continues to pull on the throttle plate cam, readjust the throttle cable threaded barrel on the throttle body.
- All engine management sensors/switches must be connected to obtain accurate TPS voltage readings. After removing the air box, reconnect the air temp./pressure sensor and lay the airbox inside the engine compartment.
- Use a fully charged 12V battery to power the engine management system

Throttle Position Sensor (TPS)- Idle Base Setting

Engine idle speed with the engine at operating temperature is 1700 +/- 200 RPM for all 2007-2011 600/700/800 CFI snowmobiles.

2007-2011 600/700/800 CFI
Engine Idle Speed
(Engine at operating temperature)
1700 +/- 200 RPM

The throttle body idle base setting voltage can be verified using Digital Wrench.

1. Connect Digital Wrench to the vehicle. Confirm the throttle lever free play is set to specification, and the throttle cable is not pulling on the throttle plate cam.
2. Click on the DATA GRID ICON to view the current sensor readings.
3. Locate the TPS VOLTAGE reading and compare it to the specification for the vehicle. Verify SENSOR REFERENCE VOLTAGE is 4.9-5.0 VDC.

NOTE: Verify all sensors/switches are plugged into the wiring harness.

TPS Voltage	0.947	Volts
Exhaust Temperature	32.0	Deg F.
Intake Air Temperature	72.7	Deg F.
Engine Temperature	70.5	Deg F.
Barometric Pressure	29.1	InHg
Chassis Voltage	0.00	Volts
Vehicle Speed	0	MPH
Sensor Reference Voltage	4.990	Volts

TPS Idle Base Setting Voltage (Using Digital Wrench)

MODEL	SPECIFICATION
600/700 CFI Engine	.94-.96 VDC
800 CFI Engine	.93-.95 VDC

4. Slowly move the throttle lever in and out. The TPS voltage should change smoothly without any erratic jumps or gaps.

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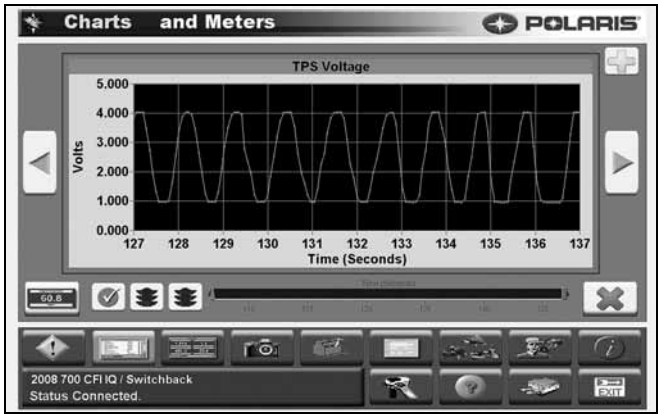
NOTE: Utilize the sensor graph function to view the TPS voltage return signal voltage as a line graph. Doing so will reveal erratic operation.

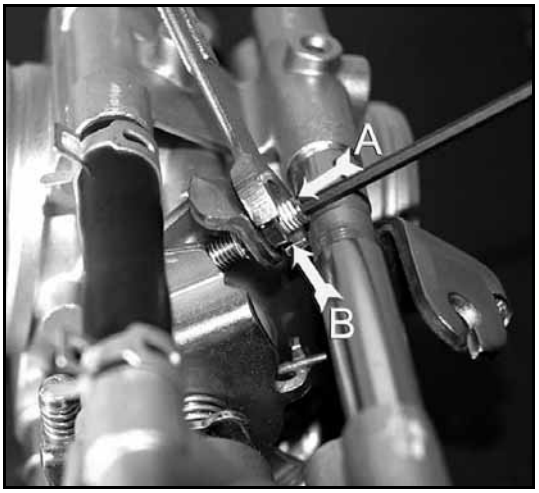


5. If erratic jumps or gaps are encountered, inspect the wiring at the sensor and ECU connector. Inspect the harness terminal pin inside the ECU connector.
6. If no wiring problems are found, inspect the TPS. Verify the TPS is securely mounted to the throttle body. If it is loose, it will have to be re-adjusted by following the Digital Wrench TPS Replacement Procedure.
7. Replace the TPS if steps 5 and 6 do not resolve the issue. Follow the Digital Wrench TPS Replacement Procedure.

Idle Speed Adjustment - CFI Engines

Normal throttle body component wear and tear may cause changes in idle speed over the lifetime of the vehicle. The idle speed screw can be adjusted to compensate for these changes.

1. Determine if the TPS or throttle plate synchronization screw have ever been replaced/adjusted. If this determination cannot be made, then idle speed screw adjustment can only be performed by following the Digital Wrench TPS Replacement Procedure.
2. Start and run the engine in a well-ventilated area or drive the vehicle until the engine/engine compartment are at normal operating temperature.
3. Note the engine idle speed. If the idle speed is within specification, no adjustment is required. If the idle speed is outside of specification, continue with step 4.
4. Stop the engine, and open the hood.
5. Remove the air box assembly. Verify the throttle lever free play is set to specification and the throttle cable is not pulling on the throttle plate cam.
6. Locate the idle speed screw (A) and jam nut (B). Loosen the jam nut. Turn the idle speed screw clockwise to raise, our counter-clockwise to lower the engine idle RPM. Turn the screw at 1/8-1/4 increments.



7. Secure the jam nut, and reinstall the air box assembly. Close the hood.
8. Re-test the vehicle and note the change in engine idle speed. Repeat steps 4 through 7 if further adjustment is required.

Digital Wrench TPS Replacement Procedure

CAUTION

The throttle position sensor (TPS) is set at the time of throttle body manufacture. TPS adjustments should only be made if the TPS was loosened, repositioned, or replaced.
Any adjustments made to the TPS sensor or throttle synchronization screw will require performing the Digital Wrench Full Procedure (TPS Replacement) guided diagnostic.

The TPS Replacement Procedure must be performed when the following occurs:

- TPS replacement
- The TPS screws have loosened, or the TPS has been repositioned
- Throttle plate synchronization screw has been adjusted
- Adjusting the idle speed screw when it is not known if the TPS has been replaced/adjusted

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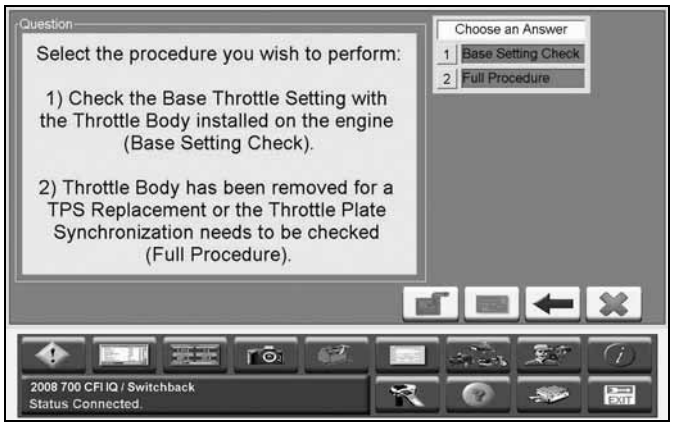
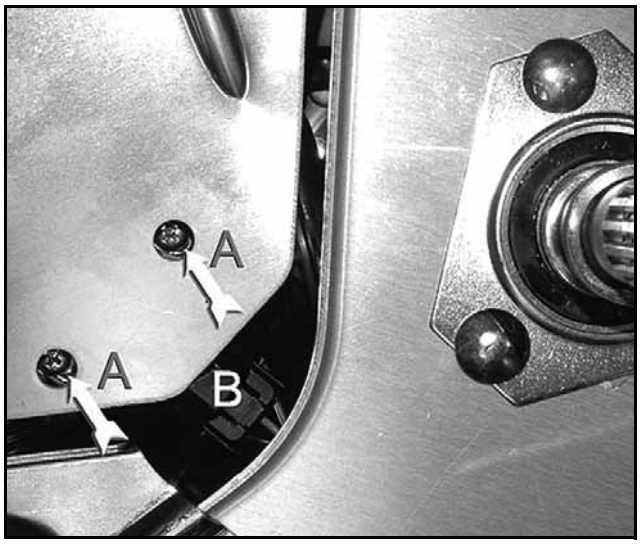
1. Click on the TOOLBOX icon.
2. Select: “OPTION 1 - TPS SETUP”.
3. Select: “OPTION 2 - FULL PROCEDURE”.


Question
Select the procedure you wish to perform:
1) Check the Base Throttle Setting with the Throttle Body installed on the engine (Base Setting Check).
2) Throttle Body has been removed for a TPS Replacement or the Throttle Plate Synchronization needs to be checked (Full Procedure).
Choose an Answer
1 Base Setting Check
2 Full Procedure
2008 700 CFI IQ / Switchback
Status Connected.

4. Read and understand the next series of screens. When finished with each screen, click: “CONTINUE”.
5. Note that removal of the throttle body is only required when replacing the TPS. The throttle body can remain mounted to the engine if only performing the TPS BASE SETTING procedure.
6. Remove the drive belt, driven clutch, and airbox. Reconnect the air temperature/pressure sensor and lay the airbox on top of the engine.
7. The TPS fasteners can be accessed through a set of holes in the TPS guard.

NOTE: The guard may need to be “flexed” to align the holes with the TPS fasteners.



- A = TPS Fasteners
- B = TPS Harness Connector

8. Remove the throttle cable from the throttle lever. Turn the inline adjuster in clockwise. Verify the throttle cable is not pulling on the throttle plate cam.
9. Digital Wrench will communicate with the ECU to determine if the TPS zero offset is set correctly. In order to measure the zero offset, the idle speed screw must be backed-out so it no longer makes contact with the throttle stop.

Throttle Closing
Loosen the Locknut (B) on the Idle Air Flow Screw (A) and turn the screw counter-clockwise until the screw tip separates from the Adjustment Lever Tab (C).
Click 'Continue' to proceed.
A
B
C
Continue
2008 700 CFI IQ / Switchback
Status Connected.

- A = Idle Speed Screw
- B = Lock Nut
- C = Throttle Stop

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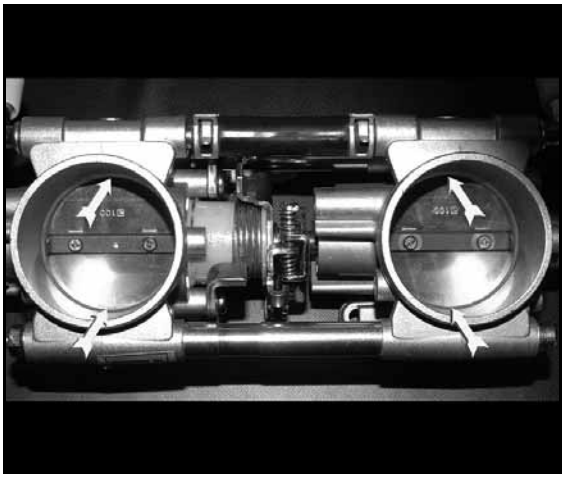
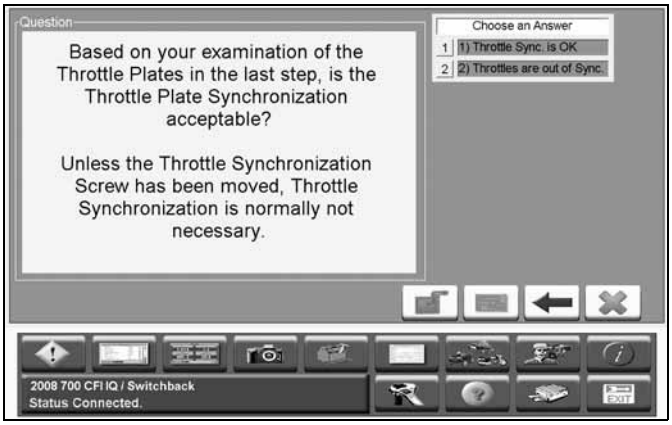
10. If replacing the TPS, replace it now with a new part.
11. Open and close the throttle plates 2 to 3 times to ensure plates are completely closed.



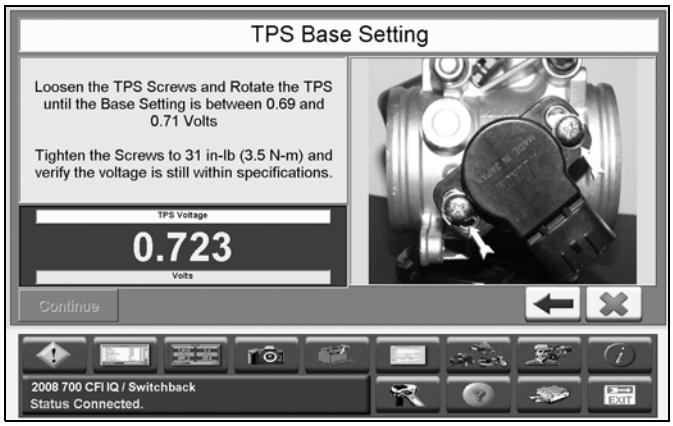
12. Digital Wrench will ask if the throttle plate synchronization requires adjustment. Select: "OPTION 1-THROTTLE SYNC. IS OK". unless it is clearly evident that the throttle plates are out of synchronization.


Question
Based on your examination of the Throttle Plates in the last step, is the Throttle Plate Synchronization acceptable?
Unless the Throttle Synchronization Screw has been moved, Throttle Synchronization is normally not necessary.
Choose an Answer
1 1) Throttle Sync. is OK
2 2) Throttles are out of Sync.
2008 700 CFI IQ / Switchback
Status Connected.
EXIT

⚠ CAUTION

THROTTLE PLATE SYNCHRONIZATION MISADJUSTMENT MAY CAUSE SEVERE ENGINE DAMAGE.

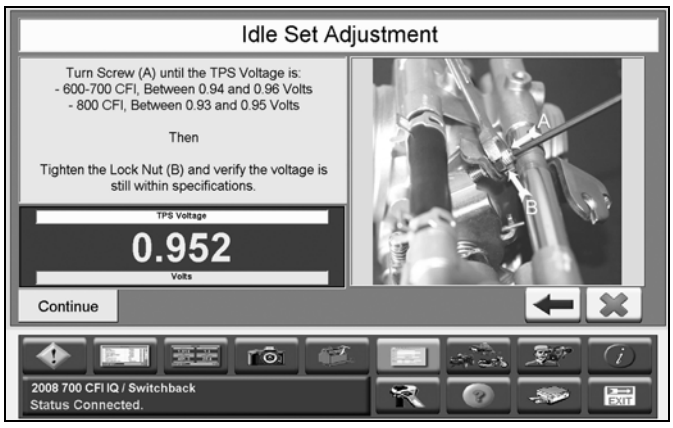
13. If throttle plate synchronization requires adjustment, select: "OPTION 2-THROTTLES ARE OUT OF SYNC." Digital Wrench will outline the steps required to re-synchronize the throttle plates.
14. Digital Wrench will now perform the TPS BASE SETTING procedure. To do this, slowly rotate the TPS until the specified TPS BASE SETTING VOLTAGE is established.


TPS Base Setting
Loosen the TPS Screws and Rotate the TPS until the Base Setting is between 0.69 and 0.71 Volts
Tighten the Screws to 31 in-lb (3.5 N-m) and verify the voltage is still within specifications.
TPS Voltage
0.723
Volts
Continue
2008 700 CFI IQ / Switchback
Status Connected.
EXIT

TPS BASE SETTING VOLTAGE
ALL 600/700/800 CFI ENGINES
.693/.698/.703/.708 VDC

NOTE: The nominal TPS Base Setting is .698VDC.

15. When the correct TPS base setting voltage is established, the CONTINUE button will turn from RED to GREEN. When this occurs, carefully tighten the TPS screws to 31 In.Lbs. (3.5 Nm). Verify the voltage has not changed.
16. Open and close the throttle plate 2 - 3 times and verify the voltage is still within specification.
17. Click on the green CONTINUE button. Digital Wrench will perform the IDLE SET ADJUSTMENT.



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18. To set the idle voltage, slowly turn the set screw (A) clockwise until the IDLE SET VOLTAGE established.

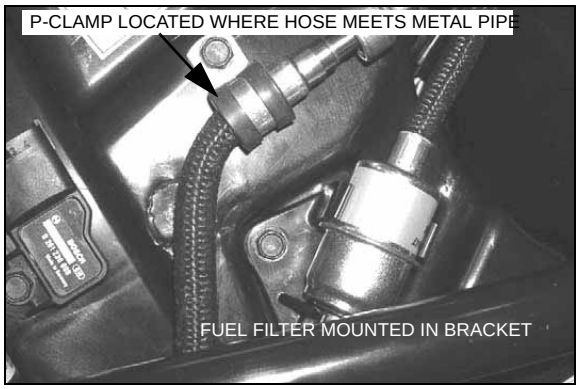
IDLE SET VOLTAGE
ALL 600/700 CFI ENGINES
.942/.947/.952/.957 VDC
ALL 800 CFI ENGINES
.937/.942/.947/.952

NOTE: Setting the idle set voltage to the low end of the specification will result in a lower idle speed. Setting the idle set voltage to the high end of the specification will result in a higher idle speed.

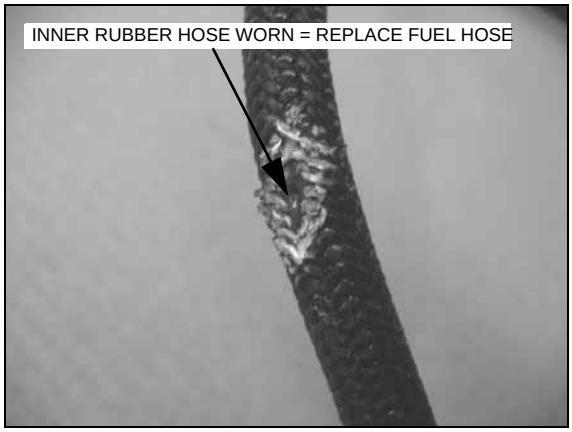
19. When the correct idle set voltage is established, the CONTINUUE button will turn from RED to GREEN. When this occurs, carefully tighten the lock nut (B) while maintaining the voltage setting.
20. Reinstall the throttle cable into the throttle lever. Set the throttle lever free play to specification. Verify the TPS voltage does not change when setting turning the throttle cable inline adjuster.
21. Reinstall the air box assembly. Verify the air box is securely attached to the throttle body.
22. Reinstall the driven clutch and drive belt.
23. Test ride the vehicle at normal operating temperatures to verify the idle speed is within specification.

Fuel Hose Mounting/Routing

The fuel hoses must be routed properly and secured to the airbox as shown in the photo below to prevent the hoses from rubbing on each other or other components.



Replace any fuel hose if the inner rubber core show signs of wear.



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FUEL TANK / PUMP SERVICE

Fuel Tank Front Flange-Type Fuel Pump

WARNING

PROPOSITION 65 WARNING
Snowmobile engines discharge fuel and exhaust which contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm, onto the snow on which they operate. Keep this engine properly tuned and avoid unnecessary idling and spillage during fueling.

Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored or used.

Do not overfill the tank past the bottom of the filler neck.

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately.

Never start the engine or let it run in an enclosed area.

Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

1. Remove the fuel from the fuel tank. Store the fuel in an appropriate fuel-holding container.
2. Remove the following components:
   - Seat Assembly
   - Console (Loosen fasteners, then lift console away from tank and set to the side.)
   - Air box.
3. If electric start is installed, disconnect the negative (-) cable, the positive (+) cable from the battery.
4. Relieve the fuel pressure. See “Fuel Rail Bleeding / Pressure Testing” on page 4.38.
5. Unplug the fuel pump electrical connector.
6. Remove the fuel hoses from the fuel pump. See “Disconnect Fittings” on page 4.39.
7. Remove the fasteners securing the fuel tank to the tunnel.
8. Remove the fuel tank from the chassis.
9. Place the fuel tank is a well-ventilated area.
10. Remove and discard the six fuel pump flange screws.
11. Carefully extract the fuel pump assembly out of the tank.

CAUTION

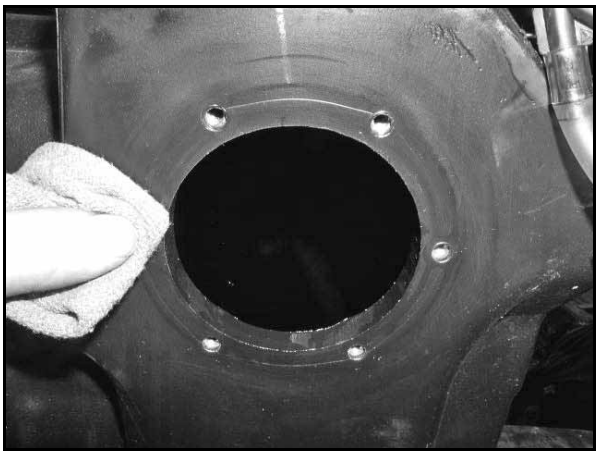
Use care when working the level sender arm through the flange hole. Do not bend the arm as inaccurate fuel level readings may occur when reinstalled.

12. Discard the fuel pump flange gasket. If the pump has failed, discard the fuel pump. If the fuel tank is to be replaced, obtain the new fuel tank.

CAUTION

NEVER RE-USE THE FUEL PUMP FLANGE GASKET. ALWAYS INSTALL FUEL PUMP USING A NEW FALNGE GASKET.

13. Saturate a clean rag with isopropyl alcohol and clean the surface of the fuel pump flange area, and the fuel pump flange. Dry all surfaces with a clean rag. Allow adequate drying time for the alcohol.



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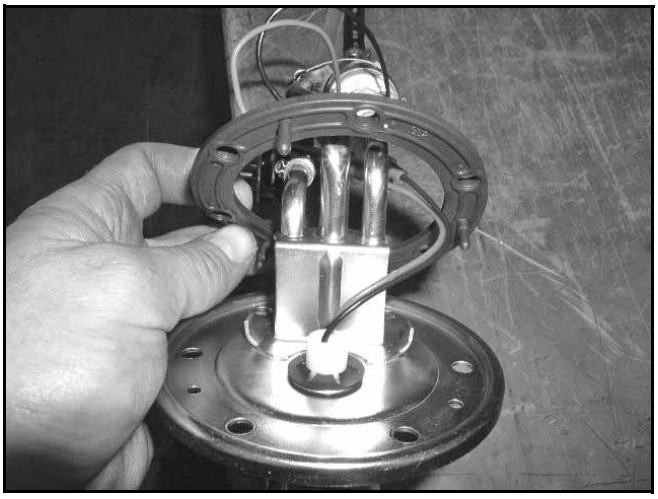
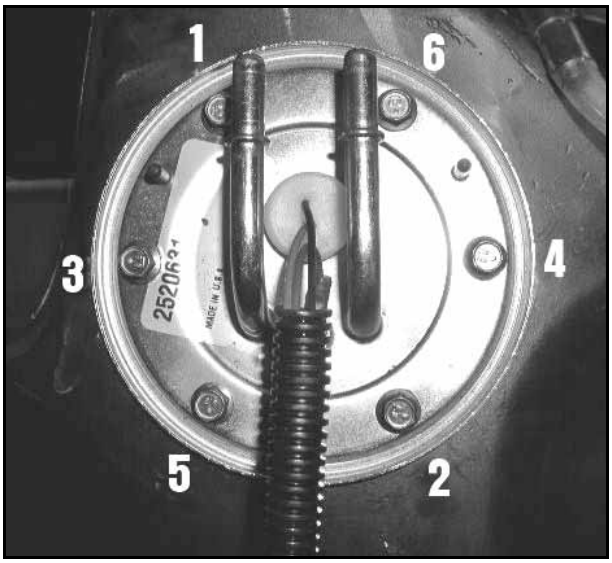
14. Install a new, clean gasket by carefully sliding it over the fuel lines, and pump components. Position the gasket with the barbs/locating pins facing the flange. Align the pins/barbs with the holes, then push and pull the barbs/pins through the holes in the flange.



15. Carefully slide the pump assembly into the fuel tank until the gasket rests on the tank.
16. Using new screws, supplied with the new gasket, thread in one of the top two screws to locate the gasket and flange in the fuel tank. A few turns of the screw is sufficient.
17. Thread the remaining five screws in by hand.
18. Using a nut driver or socket and following the specified torque sequence, sequentially turn each screw a few revolutions at a time until the gasket is just seated between the flange and the fuel tank.
19. Using a torque wrench and the specified torque sequence, tighten all screws to 10 in.lbs. (1.13 Nm). Tighten each screw in one continuous, quick motion.
20. After completing the initial torque sequence, tighten each screw to 23 in.lbs. (2.6 Nm) in one continuous, quick motion.



21. After installing the fuel pump assembly, the fuel tank must be tested for leaks by pressurizing the tank.See “Fuel Tank Pressure Test” on page 4.39.

PIN	COLOR	ITEM
1	Red	Pump Power
2	N/A	N/A
3	Black	Pump Ground
4	Brown	Chassis Ground

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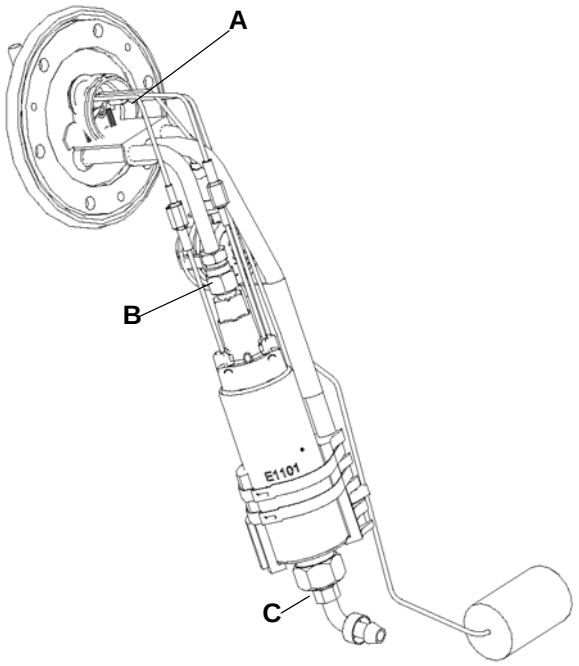
Flange-Type Fuel Pump Service

The front tank mounted flange-type fuel pump components can be service individually. Reference the appropriate vehicle parts manual for a list of serviceable parts.

Reference the following illustration for component torque specifications when assembling the fuel pump components.



= T

A = Ground Wire Hex Nut = 10 In.Lbs. (1.1 Nm)
B = Pump Flare Nut = 15 - 18 Ft.Lbs. (20 - 24 Nm)
C = Angle Fittings = 50 In.Lbs. (6 Nm)

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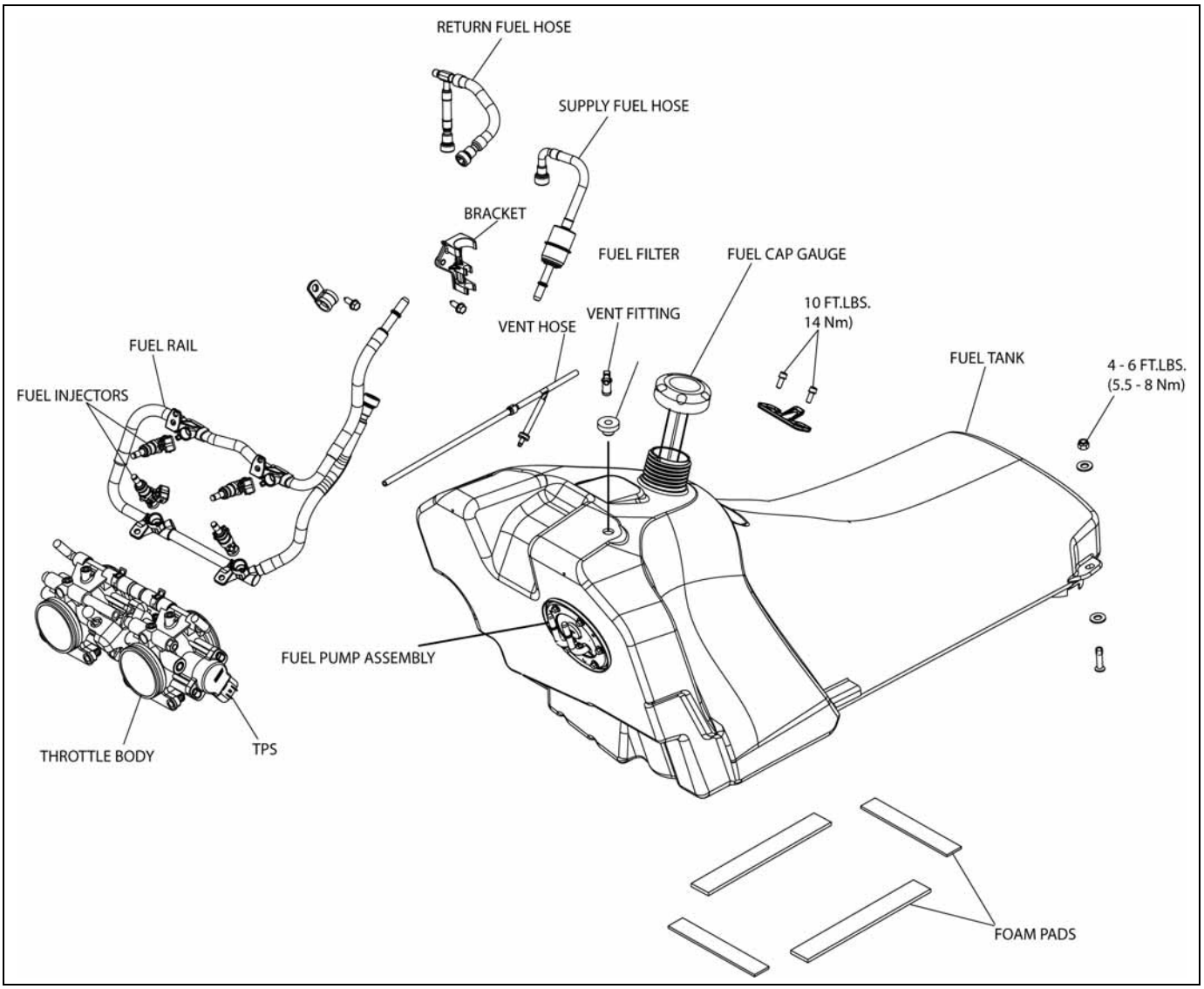
2007 700 CFI Fuel System



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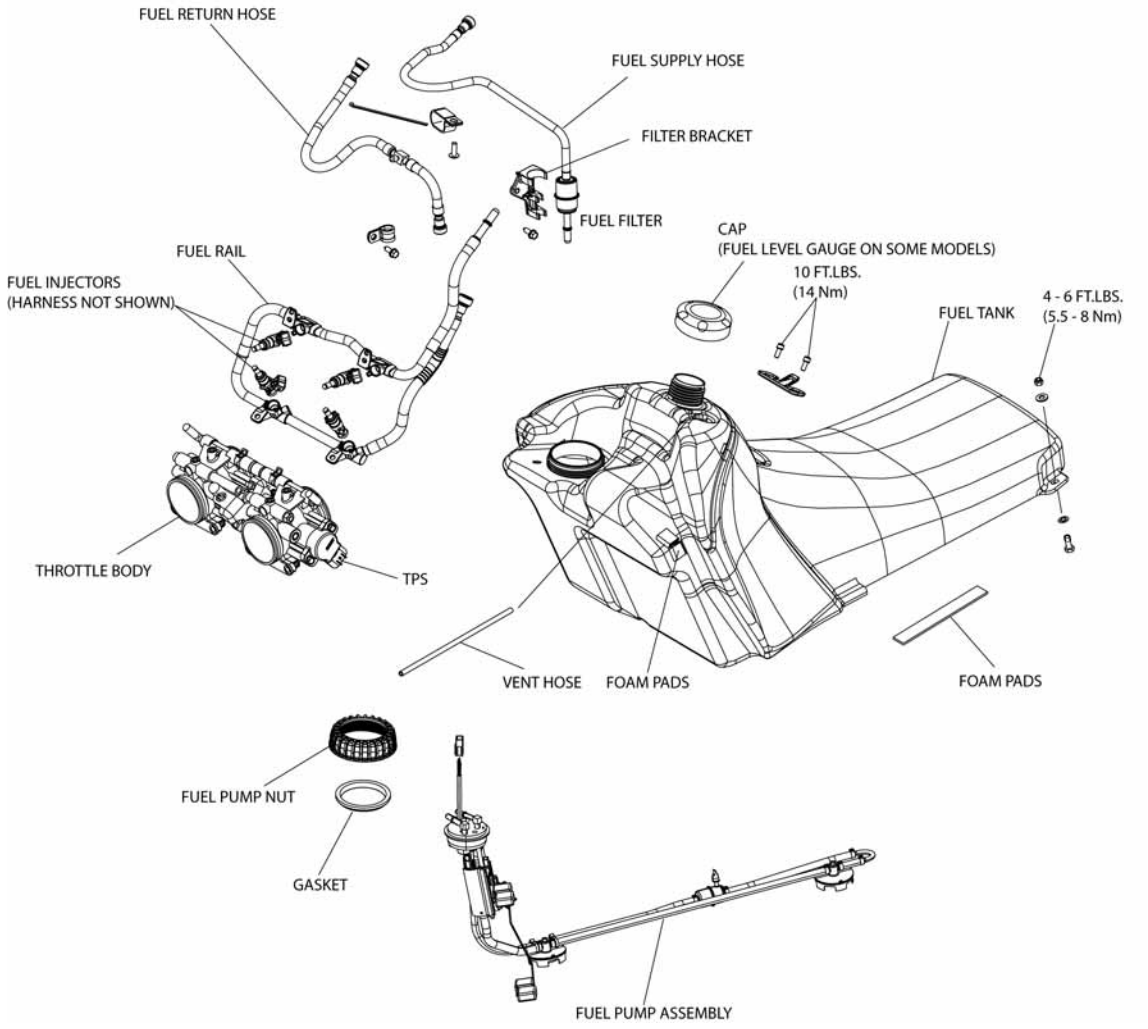
Drop In Pump Fuel Supply (Typical)



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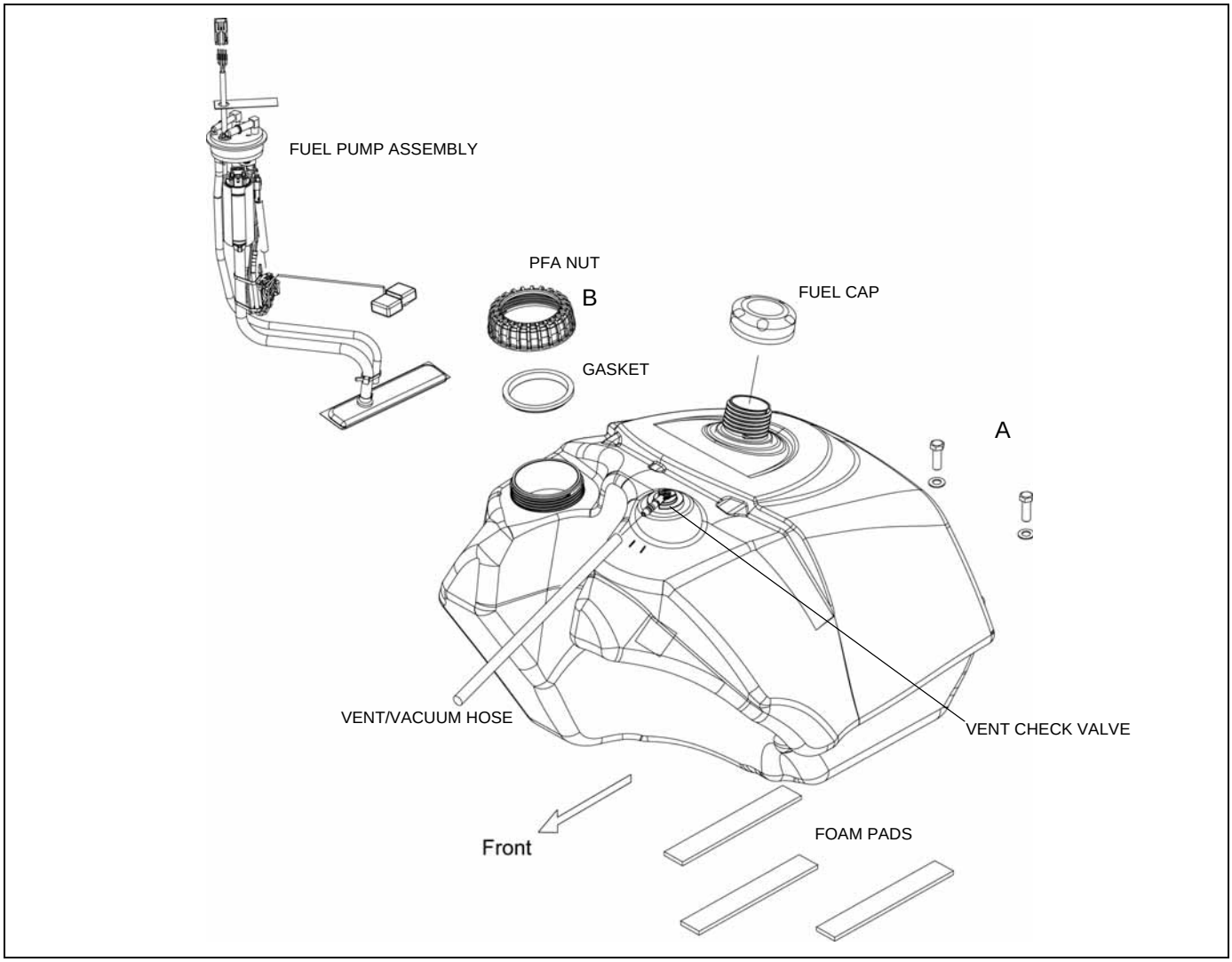
600 IQ Widetrak Fuel Supply



= T
A = 4 - 6 Ft.Lbs. (5.5 - 8 Nm) B = 28 Ft.Lbs. (38 Nm)

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Drop In Fuel Pump Service

Some models feature drop in fuel pump and fuel level sender assemblies. Reference the fuel level sender resistance table for models that display the fuel level on the MFD gauge.

NOTE: The fuel pump may be mounted on the right-side or left-side of the fuel tank depending on model.

	Ω	PINS	COLOR	FUNCTION
Full	≤ 8 ±1	1	Red	Pump PWR
1/2	40 +/-3	2	WHT/BLU	Fuel Level Sender
Empty	85 +/- 4	3	Black	Pump Ground
		4	Pink/Black	Sender Ground

Drop In Fuel Pump Replacement

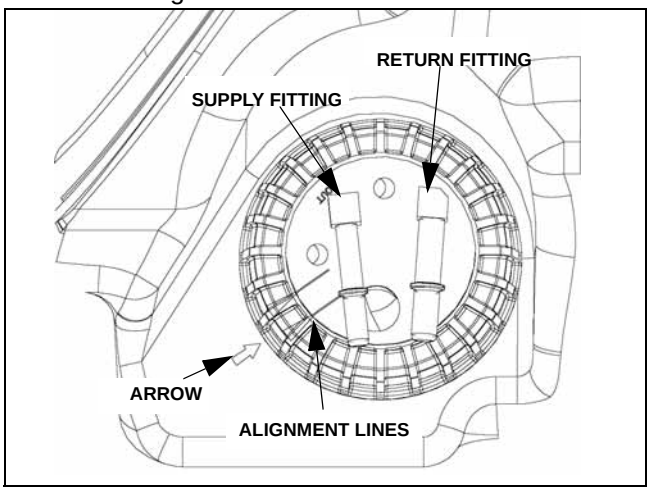
1. Siphon the fuel out of the fuel tank into a suitable container.
2. Remove the console and the seat assembly.
3. Disconnect the positive (+) battery cable from the battery if applicable.
4. Remove the fasteners securing the fuel tank to the tunnel.
5. Bleed the pressure from the fuel rail. See “Fuel Rail Bleeding / Pressure Testing” on page 4.38.
6. Lift and move the tank back to gain access to the fuel lines. Disconnect the fuel supply and return hoses from the pump flange. See “Disconnect Fittings” on page 4.39.
7. Disconnect the wiring harness, then remove the tank from the snowmobile. Place tank in a well-ventilated area.
8. Using the PFA spanner wrench and nut socket (PS-48459), carefully remove the PFA nut.

9. Carefully extract the PFA out of the tank making sure the float and fuel hoses do not become kinked or bent.
10. Remove the old gasket and destroy.

⚠ WARNING

Never re-use a used PFA gasket.

11. Clean the tank’s gasket mating surface with isopropyl alcohol. Allow the surface to dry completely.
12. Install a new gasket ensuring the inside portion of the gasket hooks onto the bead on the inside diameter of the neck.
13. Remove any containments from the gasket with isopropyl alcohol.
14. Carefully place the PFA back into the tank. Push the float assembly against the hoses to fit it into the hole.
15. Hand tighten the PFA nut keeping the arrow between the PFA alignment marks.



16. Using the PFA spanner wrench and nut socket (PS48459), tighten the PFA to specification.
17. After installing the PFA nut, verify the nut is not contacting the fuel tank surface. If the nut makes contact with the tank, the gasket may not seal. Remove the PFA nut and install a new gasket or nut combination and recheck.

= T

PFA Nut Torque = 28 Ft.Lbs. (38 Nm)

18. Fuel tank installation is the reverse of removal. Always test the PFA gasket seal before tank installation by performing a pressure check.

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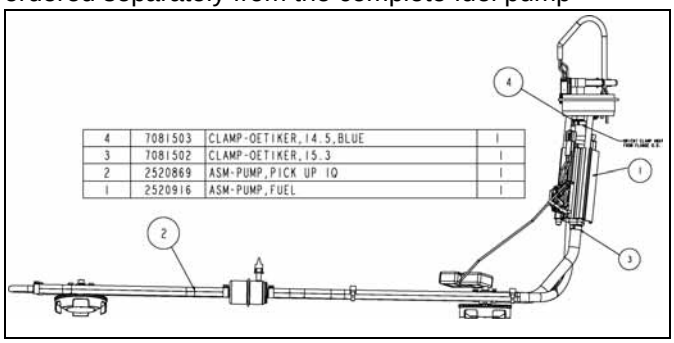
Drop In Pump Service

The pickup hose / vapor separator assembly can be ordered separately from the complete fuel pump



DIGITAL WRENCH DIAGNOSTIC SOFTWARE

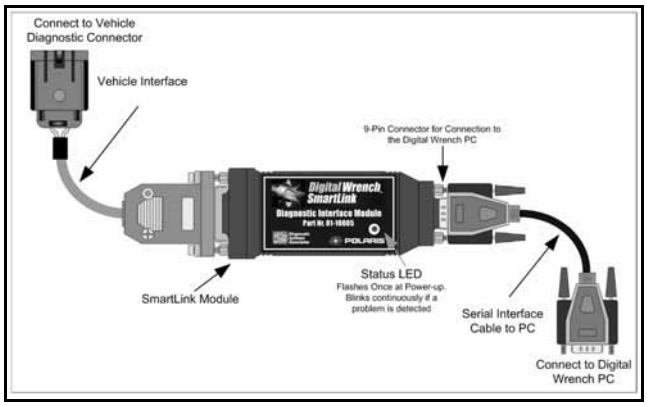
Overview

The Digital Wrench diagnostic software allows the technician to perform the following tests and observations:

- View / clear trouble codes
- Analyze real-time engine data
- Reflash ECU calibration files
- Guided diagnostics
- Create customer service account records

The following components are required to use the Digital Wrench software:

- PC or laptop with Microsoft Windows operating system
- Digital Wrench software, part number PU-47063
- Smart Link Module, part number PU-47468
- Interface Cable, part number PU-47469
- PC Interface Cable, part number PU-47470
- Smart Link Module Kit (Includes PU-47468, PU-47469, and PU-47470 in one kit), part number PU-47471
- M-10 ACE/ECU-Chassis Power-Up Cable, part number PS-47296-A
- 12-volt battery


Connect to Vehicle Diagnostic Connector
Vehicle Interface
9-Pin Connector for Connection to the Digital Wrench PC
Digital Wrench SmartLink
Diagnostic Interface Module
SmartLink Module
Status LED
Flashes Once at Power-up. Blinks continuously if a problem is detected
Serial Interface Cable to PC
Connect to Digital Wrench PC

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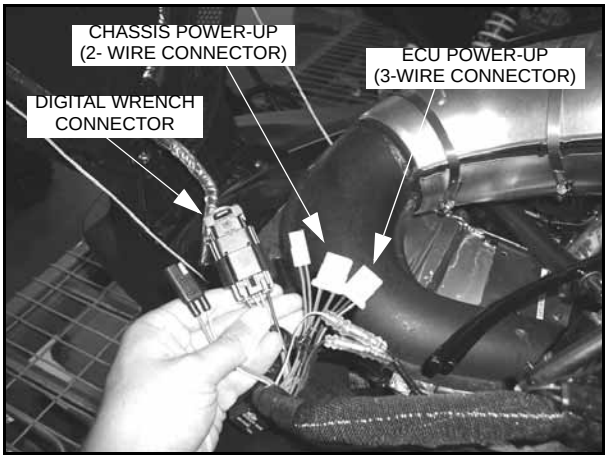
CFI Digital Wrench Connections

The access point for the ECU power-up and Digital Wrench connectors is located in the front, left-side of the nosepan.



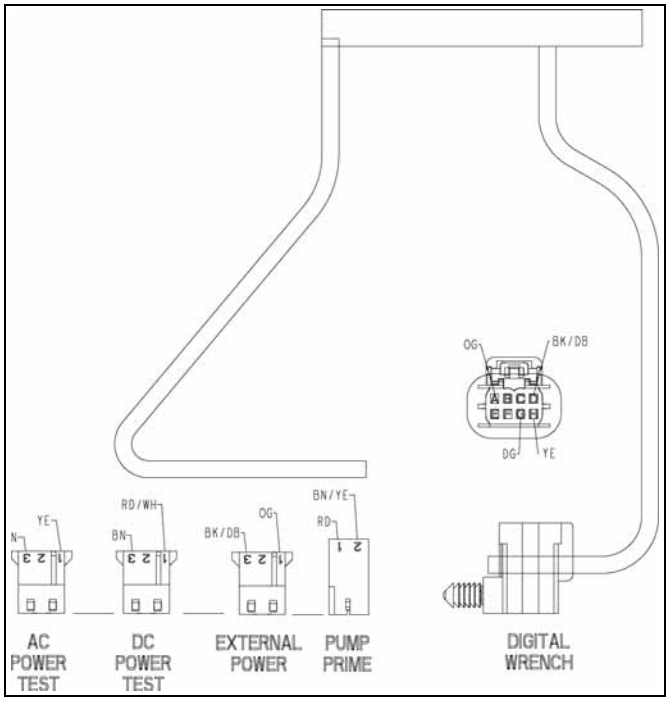
Follow these steps to connect the diagnostic and power-up cables to the snowmobile:

1. Assemble the Smart Link cables and module as shown in the illustration.
2. Open the hood and locate the connectors. Remove the protective cap from the Digital Wrench connector.
3. Connect the vehicle interface cable to the Digital Wrench connector.
4. Using the power-up cable, part number PS-47296-A, and a fully charged 12-volt battery, connect the power-up cable to the ECU POWER-UP connector.

NOTE: To verify the 12-volt battery and power-up cable are working, connect the cable to the chassis power-up connector. If working correctly, the headlights should illuminate.

DC-CFI Digital Wrench Connections

The access point for the ECU power-up and Digital Wrench connectors is located in the front, left-side of the nosepan.



Follow these steps to connect the diagnostic and power-up cables to the snowmobile:

1. Assemble the Smart Link cables and module as shown in the illustration.
2. Open the hood and locate the connectors. Remove the protective cap from the Digital Wrench connector.
3. Connect the vehicle interface cable to the Digital Wrench connector.
4. Using the power-up cable, part number PA-46355, and a fully charged 12-volt battery, connect the power-up cable to the EXTERNAL POWER connector.

NOTE: To verify the 12-volt battery and power-up cable are working, connect the cable to the DC power-up connector. If working correctly, the MFD gauge should illuminate.

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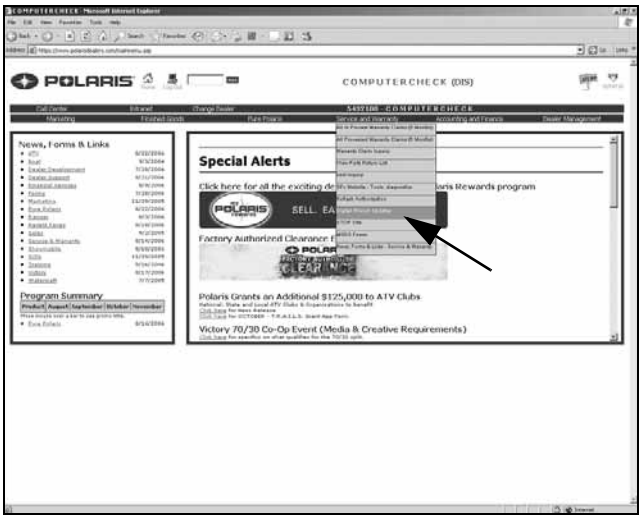
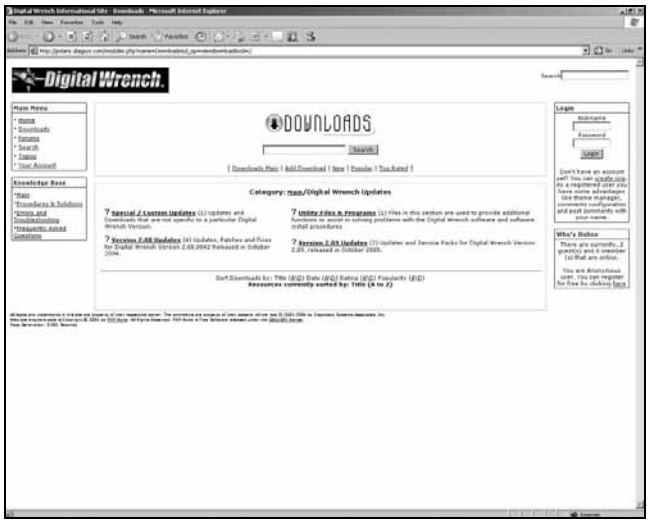
Updating Digital Wrench

Updates are released for Digital Wrench via the Internet. The Digital Wrench update website can be found by accessing the dealer Internet site at: www.polarisdealers.com.



NOTE: Only authorized Polaris dealers and distributors can access the dealer Internet website.

1. Log on to www.polarisdealers.com.
2. Locate the “SERVICE AND WARRANTY” drop-down menu.
3. Click on “DIGITAL WRENCH UPDATES”.
4. The next screen is the Digital Wrench portal website.



The following selections can be made on the update website:

- Home - Digital Wrench Home Page
- Downloads - Listing of current filesets and Digital Wrench downloadable updates
- Forums - Member generated knowledge base
- Search - Website search engine
- Topics - Vehicle-specific Digital Wrench information

5. Locate the version of Digital Wrench currently running on the PC or laptop.
6. Locate and click on the update pack required. Save the file to the PC or laptop’s desktop.
7. Locate the update file on the desktop. Double-click and select “RUN” on the icon to install the update.
8. Delete the file after performing the update.

NOTE: Delete the update file from the desktop when finished.

Version Identification

Knowing what Digital Wrench or fileset versions are installed will help determine which updates are required.

NOTE: Version and fileset versions are subject to change.

1. Start the Digital Wrench software.
2. Locate the version ID on the title screen.

3. Click on the “SPECIAL TESTS” icon (toolbox).
4. Click on “ENGINE CONTROLLER REPROGRAMMING”.
5. Locate the fileset version number.

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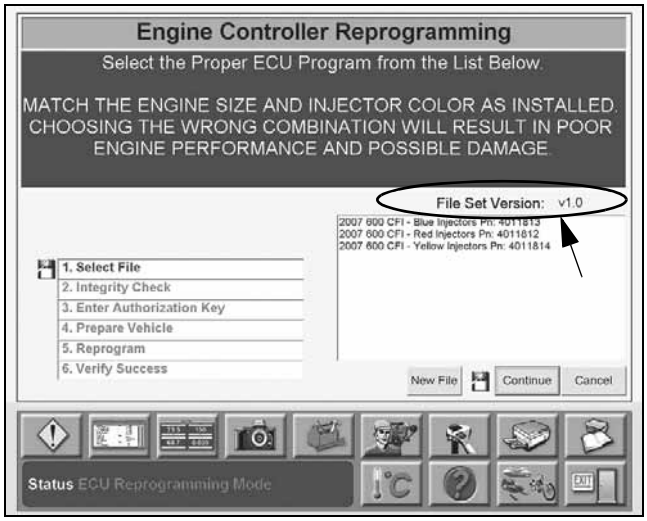

Engine Controller Reprogramming
Select the Proper ECU Program from the List Below.
MATCH THE ENGINE SIZE AND INJECTOR COLOR AS INSTALLED.
CHOOSING THE WRONG COMBINATION WILL RESULT IN POOR
ENGINE PERFORMANCE AND POSSIBLE DAMAGE.
File Set Version: v1.0
2007 600 CFI - Blue Injectors Pn: 4011813
2007 600 CFI - Red Injectors Pn: 4011812
2007 600 CFI - Yellow Injectors Pn: 4011814
1. Select File
2. Integrity Check
3. Enter Authorization Key
4. Prepare Vehicle
5. Reprogram
6. Verify Success
New File
Continue
Cancel
Status ECU Reprogramming Mode

Engine Controller Reprogramming (Reflash)

NOTE: New service replacement ECUs are programmed as "no-start" and must be reflashed for the engine and fuel injector code.

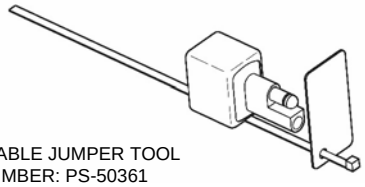
1. Verify the most current update is downloaded and loaded into Digital Wrench. See "Version Identification" on page 4.57.
2. Connect the communication cables to the snowmobile connectors. See "CFI Digital Wrench Connections" on page 4.56.
3. Start Digital Wrench. Select the model year and machine using the "CHANGE VEHICLE TYPE" button.
4. Click on the "SPECIAL TESTS" icon.
5. Click on "ENGINE CONTROLLER REPROGRAMMING".
6. Select the engine model and color of the injectors installed on the engine. Record the 7 digit injector part number. Click "CONTINUE".

NOTE: All fuel injectors on the engine must share the same color code.

The most-current reflash files will be located at the top of the list and will not have "SUPERSEDED" in the file name.

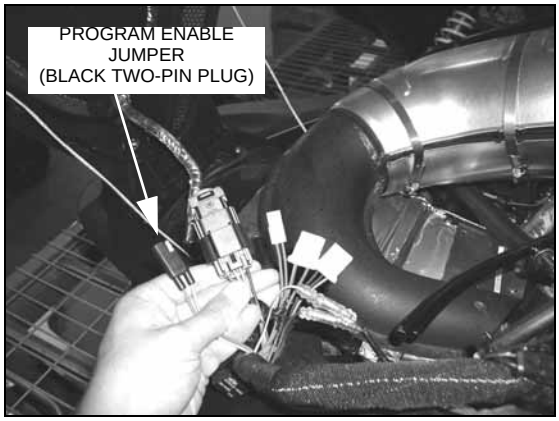
Files with "SUPERSEDED" in the file name denote older calibrations.

7. On CFI models, locate the "program enable"/"mode change" jumper connector. Insert the Reflash Enable Jumper tool, SPX PN: PS-50361. Click "CONTINUE".



REFLASH ENABLE JUMPER TOOL
SPX PART NUMBER: PS-50361

NOTE: DC-CFI models do not feature a program enable jumper.



⚠ CAUTION

If the Reflash Enable Tool is not available, use a short piece of insulated wire to make the connection. Do not allow the jumper wire to touch the exhaust pipe or any other grounded metal component.
ECU damage will occur.

8. A request code will be generated. Record the code.

Engine Controller Reprogramming
Note the Request Code below and obtain an Authorization Key from the Dealer Web Site. Enter the Authorization Key in the Proper Field to Continue.
DO NOT SHUTDOWN THE SOFTWARE UNTIL REPROGRAMMING IS COMPLETE OR THE AUTHORIZATION KEY WILL BE LOST !
Request Code: AIBAFDBN
Authorization Key:
1. Select File
2. Integrity Check
3. Enter Authorization Key
4. Prepare Vehicle
5. Reprogram
6. Verify Success
Continue
Cancel
Status ECU Reprogramming Mode

9. Access www.polarisdealers.com. Locate "REFLASH AUTHORIZATION" under the "SERVICE AND WARRANTY" drop-down menu.

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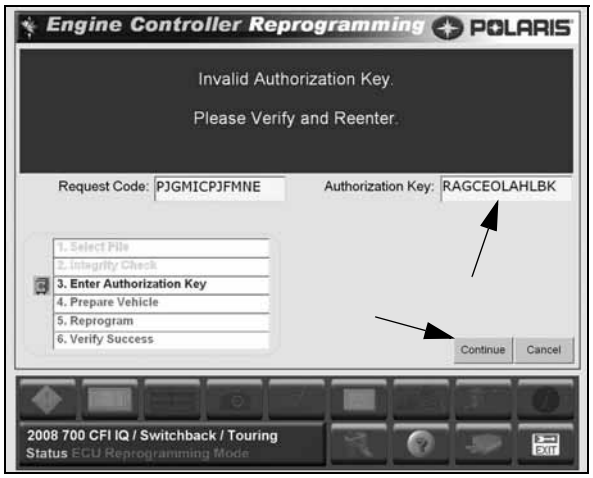
10. Enter the REQUEST CODE generated by Digital Wrench into the information box.

11. After entering the REQUEST CODE, click “CONTINUE”.

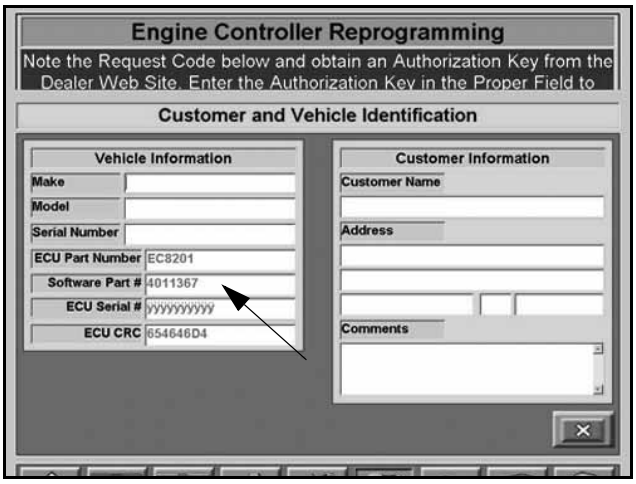
12. The next screen asks for the following information:

    - Desired Reflash File
    - Vehicle VIN
    - Customer Name, Address, Zip Code

13. After entering the required information, click “CONTINUE”.
14. If all of the information was accurate, the website will generate and AUTHORIZATION CODE.
15. Copy the code, and then enter the code into the AUTHORIZATION box in Digital Wrench. Click “CONTINUE”.



16. The reflash process will begin. Verify all connections are properly made. Do not touch anything during the process.
17. Verify the reflash was a success by comparing the software ID number listed under the “CUSTOMER AND VEHICLE IDENTIFICATION” button with the number recorded in step 6.



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TROUBLESHOOTING

Flowchart

STEP 1 Preliminary Checks	DOCUMENT THE BASICS 1. VIN 2. Vehicle Miles 3. Issue(s) 4. Vehicle / Engine Modifications (Required info. for Polaris to perform proper diagnostic assistance.) 5. Check unit against Unit Inquiry for any outstanding Service Bulletins or Team Tips 6. Type of fuel in the fuel tank / Fuel Selector Status - (Select models only, excludes 700 RMK and 600 Touring) The fuel selector jumper wires or resistor plug must be set as outlined below based off of the type of fuel in the tank. -4 Injector CFI engines: 87 / 89 / 91 w/10% ethanol fuel = fuel selector wires unplugged. -4 injector CFI engines: Premium non-ethanol fuel = fuel selector wires plugged together. -2 injector CFI engines: 87 / 89 / 91 w/10% ethanol fuel = 24 ohm resistor plug installed. -2 injector CFI engines: Premium non-ethanol fuel = 160 ohm resistor plug installed.
STEP 2 Using Digital Wrench	DIGITAL WRENCH (DW) 1. Is DW the most current version? Check the DW update site (http://polaris.diagsys.com/modules.php?name=Downloads) to review and download any available updates. 2. Connect DW to the vehicle. Are there any trouble code(s)? Document all of the trouble code(s), both historic and current. Use guided diagnostics to troubleshoot current trouble code(s). Once repairs are made and trouble code(s) are cleared, do any return? Start the engine and confirm trouble code(s) to not re-appear. If trouble code(s) re-appear, continue to troubleshoot issue using guided diagnostics and Service Manual. 3. Review the ECU information for the vehicle. Does the ECU map match the vehicle's configuration / fuel injector color and part number? If not, reflash the ECU using the correct color-coded map / part number that matches the fuel injector color / part number installed on the engine. 4. Is the vehicle subject to any Service Bulletins, or Team Tips where revised ECU reflash files have been made available? If so, verify the Service Bulletin or Team Tip has been performed if required and the ECU information matches the revised reflash files.
STEP 3 Clutching	CLUTCHING 1. Do the drive clutch weights match what is specified for the elevation where the vehicle is operated? If not, install the specified drive clutch weights based model specifications for the vehicle located in the appropriate Service Manual or Owner's Manual Supplement. 2. If the vehicle is a 2009 600 IQ Shift 136, has Service Bulletin S-09-01(A) been performed and a new driven helix and spring been installed? 3. Inspect drive belt deflection and adjust if required. Replace the belt if it is hour-glassed, shows heavy glazing or severely worn.
STEP 4 Throttle Lever	THROTTLE LEVER FREEPLAY 1. Check the throttle lever freeplay. Too much slack in the throttle cable can cause runability issues. 2. Is the throttle lever freeplay = .010 - .030 inches? If not, reset the freeplay to specification and retest vehicle.
STEP 5 Fuel System	FUEL SYSTEM 1. Using Digital Wrench, verify the fuel injector supply voltage is 16Vdc when the engine is running. 2. Using the appropriate fuel pressure gauge (see Service Manual), verify the fuel pressure when the engine is running is 58 PSI (4BAR). 3. If the fuel pump voltage is good, but the fuel pressure low, replace the fuel filter and recheck fuel pressure.
STEP 6 EGT Sensor	EXHAUST GAS TEMPERATURE SENSOR 1. Using the data display tool in Digital Wrench, monitor the EGT sensor function while the engine is running (vehicle raised off the ground on a sled lift or track stand) at or above 3,000 RPM. 2. Does the exhaust gas temperature value change with changing throttle lever input after running the engine for 60 seconds at or above 3,000 RPM? 3. If the EGT value does not change, inspect the sensor wiring and connections. If the wiring and connections are good, replace the sensor and retest.
STEP 7 Exhaust System	EXHAUST SYSTEM 1. Check exhaust system for leaks, missing, over-stretched damaged springs, and worn out seals. Replace components as required. 2. Remove the resonator and shake. Replace resonator if shaking reveals loose internal baffle plates.
STEP 8 Ignition System	IGNITION SYSTEM 1. Insect the spark plug caps and spark plugs. Are the caps worn, oblong, or bent? Replace cap(s) as required. 2. Have the spark plug(s) worn into the top of the cap(s)? If so, replace both the affected spark plug and cap as required.
STEP 9 Exhaust Valves	EXHAUST VALVES 1. Inspect the exhaust valve solenoid vent system (discharge hose) for leaks or plugged / kinked hoses. Repair or re-route hoses / connections as required. 2. Do the exhaust valves move as RPM increases? Test exhaust valve motion by installing a 1 inch piece of clear, fuel vent hose onto each EV cap nut through the hole in each EV housing. Start the engine and increase the engine speed past 6,000 RPM to check for proper valve operation. 3. Do both valves move at the same time / rate? If not, inspect one or both EV assemblies. Inspect for torn bellows, worn EV springs and loose bellows cap nuts. Verify the EV base vent and cylinder holes are clean and free from carbon or heavy residue.
STEP 10 Pistons	PISTONS 1. With the exhaust valve assemblies removed from the cylinders, insert a piston wash light or use a flashlight to inspect the exhaust-side of the pistons. Is heavy scoring, scratching or ring damage visible? 2. If piston skirt, or ring damage is visible through the exhaust valve slots, the pistons should be replaced and the cylinders inspected and lightly honed with an Ammco 320 grit (or equivalent) NiCaSil oversize honing stone.

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